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A course of
Anatomical Lectures
delivered at the
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By
Joseph Pancoast M.D.
Professor of Anatomy (descriptive and surgical)
written out from
current notes
By
Edward R. Squibb

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It was first imagined by Haller – and subsequently proved by experiments with very delicate instruments, by Helmholtz & others that the nervous fluid or agent, travels along our nerves, at a slower rate than we had supposed, ~~much~~ many times slower than Electricity, or light – the nervous fluid going about 100 feet in a second – so that a whale 100 feet long – if it was struck in the tail with a harpoon – would be a second in having the sensation carried up to the sensorium in the brain – and would take another second, to enable it to move the muscles in the tail, so as to strike a blow – these 2 seconds would aid the harpooners to retire the boat –

In the reflex action of the spinal cord in man, there is a delay of 1/30 to 1/40 of a second longer than in the ascent of impression up to the brain – that is when a sensation ~~going~~ impinging upon the spinal cord, starts an involuntary motion, by the intervention of the ganglionic cells of the cord, – it takes more than 12 times, the time required for the transmission of the stimulation, through the sensory & motor central nerves.

– Haller says to pronounce the sound of the letter R, requires ten successive contractions of the stylo-glossus muscle – and that in one minute a muscle contract & relax 15,000 times – the contraction & relaxation being equal in time, would take about the 1/30000 part of a minute or 1/500 part of a second – He calculated that the nervous agent would require about the 1/500 part of a second, to go from the brain to the stylo-glossus muscle – which is a distance of about 4 inches thus giving the rate at which the nervous agent travels, at about 160 feet in a second – a higher rate than the above, –

– The arterial wave which in superficial arteries is felt as pulse goes out, three times slower than the nervous agent –

– Even thinking requires a little time – about the quarter part of a second as proved by instrument – so quick as thought is not so very quick –

– In Paralysis, the course of the nervous fluid, is probably slower,

– The nervous fluid strange to say, moves even in its healthy state 1/10 less quickly than sound in air – It cannot therefore be identified with the electric current which goes – What we call nervous agent, if we look at its small velocity, in all probability is some internal motion, perhaps some chemical change, of the substance itself contained in the nerve tubes, spreading along the nerve tubes× – It may be electricity which thus acts from molecule to molecule of the nervous substance – But we cannot consider the nervous agent as identical with Electricity –

×Henry Bence Jones, Croonian Lecture

Lect. LI.

I wish to day gentlemen, to direct your attention to the sources and distribution of the arteries which supply the inferior extremity, in as much as we have finished the consideration of the muscular structures. The Abdominal Aorta, the great source of supply to all the lower portions of the body, after getting in front of the spinal column, divides into two large branches opposite to the fourth lumbar vertebra, the one branch going upon either side. These first branches are called the right and left Primitive Iliac Arteries, and run obliquely downward, outward and backward, until they arrive at the sacro iliac junction, when a division occurs into internal and external iliac arteries, the first dipping down into the cavity of the pelvis, to supply the viscera there, whilst the other is continued in the direction of Pouparts ligament. These arteries as well as the great Abdominal aorta, lay behind the peritoneum as you perhaps all know by this time, and are both therefore accessible without injury to this delicate membrane. To apply a ligature to them, as may become necessary under certain circumstances of wounds &c an incision is made above Pouparts ligament, through the muscles and tendons, and the peritoneum is carefully pushed off from the side by the hand, until you get around to the artery about which the ligature is placed, and the parts returned to their position. Even the great trunk of the aorta may thus be reached and a ligature placed upon it, as has been done by Mr Murray at the Cape of Good Hope, without any violence done to the continuity of the peritoneum. If not acquainted with the reflections of the peritoneum and the facility with which it is separated from the tissues with which it is in contact, you might suppose this impossible, and that the performance of such an operation would necessarily imply a cutting directly down upon the vessel, through the peritoneal coats. We shall confine ourselves to day principally to the blood vessels which go to the lower extremity, or rather to the distribution of the external Iliac artery, for there are many branches from the internal, which get out at the various openings in the pelvis to be distributed there and anastomose with branches from the external. Although the main portion of this internal is appropriated to the viscera within the pelvis, which we shall have

to study separately, and in connexion with their various viscera, The external Iliac however is distributed exclus-ively to the lower extremity with the exception of a portion of the abdominal walls, We have passing over these arteries on its way to the bladder, this which is the Ureter the position of which should be carefully remembered in the operation for ligature of the vessels, as its presence somewhat complicates the proceeding from lying directly in front of them, It must of course be avoided, as a ligature around it would lead to unfortunate results, - it however being readily pushed aside, We have here a cord which in this instance is quite large, and readily traced from the internal iliac artery to the bladder, having a fold of peritoneum reflected over it, This is the umbilical ligament of the bladder in adult life, as it passes also from the top of the bladder, in conjunction with its fellow of the opposite side, to the umbilicus, and is constituted of the remains of what in the foetus was the umbilical artery, This is usually a simple cord but in some subjects we find it still patulous, receiv-ing sometimes a portion of the injecting fluid, In ad-ult life the external Iliac is larger than the internal, but in the foetus this is reversed, the internal being the larger from receiving the umbilical arteries from the placenta, The external Iliac after the separation of the internal passes down upon the linea ilio pectinea or brim of the true pelvis, to gain Pouparts ligament under which it passes to become femoral upon the upper part of the thigh, This passage under the ligament we have noticed at another time, when we saw that it occ-urred about the middle of the ligament, say 3 lines to the inside of the middle point in the male, and half an inch in the female, Before arriving at the ligament it does not give off a single branch, but at this point gives of some of importance, The internal Iliac gives off a branch of considerable size just after its separa-tion from the main trunk, This is the ilio lumbar which runs out laterally between the great primitive ili-ac vein and the bone, after which it branches to supply a part of the iliacus internus muscle, The main trunk then dips under the psoas magnus muscle, and after

sending a branch to the quadratus lumborum muscle and other parts in the vicinity of the loins, - inosculates by a trunk of considerable size with the circumflexus ilii artery, a branch of the external iliac as we shall see, This circumflex ilii artery is given off from the external iliac just at its passage under Poupart's ligament, - is a vessel of considerable size, and runs outward until it gains the crest of the ilium, along the inner margin of wh-ich it runs dipping below the fascia and supplying the iliacus internus and the surrounding structures until it has got back to the lumbar region where it as before mentioned anastomoses by a large orifice with the ileo lumbar. This is one of those beautiful arrange-ments which seem to be provided by nature against the obstruction of the important main trunks. - for in the event of the application of a ligature to the external ilia-c artery this ileo lumbar would convey arterial blood around the this circumflex ilii artery, in a direction con-trary to its usual course through this vessel, - for the sup-ply of the lower extremity, This however is only one of many passages which the blood would take in such a case, - by the anastomoses of other vessels, This necessity which may occur for the arteries conveying blood in a direction contrary to the natural one, seems to be the reason why these vessels are not supplied with valves like the veins, for in their natural function we might suppose that valves would rather aid in the transmission of the blood. Veins on the other hand, from the fact of being furnished with these valves, are not to be obstructed with impunity, for to tie a large one, would be to put an end to the patients life with certainty, by the indu-ction of venous congestion inflammation and gangr-ene, Then whilst the ligature or obstruction of a vein is an affair of great danger and hazzard, - the same occurrence in an artery is comparatively not at all serious. Another branch in connexion with this sys-tem of anastomoses is the Spermatic artery, This comes off generally from the Aorta, always thus on one side whilst on the other it frequently comes from the renal or emulgent artery, This runs down along with the Sperm-atic cord, forming one of its constituents. and sending

off a number of anastomosing branches to unite with those from the epigastric, which we now come to notice. As the external iliac gets to the upper edge of Poupart's ligament it sends off its first branch, a trunk of considerable size and great importance surgically, called the Epigastric artery. This artery sometimes, however instead of coming off from the external iliac, comes from the Obturator, a branch of the internal iliac, and this obturator in turn, sometimes comes from the epigastric. When the latter does come from the obturator it runs up to gain the external margin of the rectus muscle in the same way as though it had its usual origin. This remark is of universal application, for as every part must have a certain amount of arterial blood sent to it for its support, so the vessels conveying this, whatever anomaly may exist in their source, still must attain to the ordinary end, and arrive at the common point of distribution. Of this there is no better illustration afforded than that already alluded to, - of the origin of the obturator from the epigastric, in which case it runs straight down the bone to gain the obturator foramen through which its course always lays. The anomalous distribution sources, of these arteries whether of one ~~or~~ the other, always involves the parts concerned in the formation of crural hernia, and in some instances run so as actually span the crural ring, as in the preparation before you where the pink bundle represents the position of the strictured sack. This anomalous condition of the vessels only occurs once in six cases, which it is necessary to remember and only in one case out of six of these again is it found encircling the ring as represented. These arteries are not constantly found upon one side of the ring and although of this anomalous character I can not find that it has ever been cut in any one of these cases, although having searched with some attention. In olden times the division of this artery was the ordinary cause of death after the operations, until the time of Scarpa and who instituted a better mode of practice. In the cases where the artery is felt pulsating all around the finger when introduced into the ring in the operation, - the mode devised by

me in a case of the kind, - of dulling the knife by the handle of a pair of forceps, so that the resisting stric-ture would be divided, whilst the movable artery would be pushed up by the dulled edge, - will generally be found to answer a very good purpose. This method then laid down, when speaking of Inguinal hernia, - of avoiding this epigastric artery, must always be borne in mind namely always, under every circumstance to cut directly upwards. The vessel runs up directly between the two rings, a little nearer however, to the internal, than to the external. These terms internal and external as applied to these rings must be understood as not relating to the middle line of the body laterally or else they would lead to confusion, - applying as they do only to the perforation of the internal and external layers of the abdominal walls. For this liability to confusion the terms are objec-tionable, and might be better designated anterior and posterior. In old hernias we here see again that the constant traction necessarily made by the weight of the sack could not avoid bringing these rings in apposition by effacing the obliquity of the canal, and thus drawing down the artery into such a position as readily to be cut if the general direction of cutting upward was not observed. We might have a stricture occurring, and say to ourselves, I know this is at the external ring, and I know too, that the artery lies nearer to the internal, and therefore may cut outward with safety; but this is by no means the case, as the vessel may very well have been drawn down out of its natural position, to occupy just that taken by the knife, and in case of cutting this large trunk the cellular tissue being loose around, the whole tissue would be filled with blood as well as the cavity of the pelvis, and the patient of course die unless the hemorrhage was speedily arrested. It should be remembered that the situation of these rings are never perfectly natural, except in the healthy condition of the parts, or just at the beginning of hernia, at which time the surgeon has rarely any thing to do with them, - and that there is there-fore no line of safety except the one laid down, namely that of always cutting directly upwards, parallel with

the direction of the linea alba. This Epigastric art-ery gets to the edge of the rectus abdominis muscle about two inches above its origin, and from thence is distributed mainly to this muscle, its branches run-ning through it in every direction whilst a considerable branch together with some of smaller size may be traced up to inosculate with those of the internal mammary artery, thus forming a means of communication between the upper and lower parts of the body independently of the great aorta. This is a very important anastomosis when the aorta or iliac arteries have been tied or obstr-ucted, as supplying blood to the lower extremities. When the external iliac gets under Poupart's ligament, from the lower margin of which it takes the name of fem-oral, — it sends off a branch of considerable size to the superficial structures upon the lower part of the abdomen. This is called Arteria ad Cutem Abdominis, or sometimes very improperly, the superficial epigastric, as this name should be wholly appropriated to the branch last con-sidered, which it is of so much surgical importance not to confound with any other. This Arteria ad Cutem, wh-ich is one of the earliest branches from the femoral, goes to supply first the superficial set of lymphatic glands which we found lying between two layers of the super-ficial fascia, after which the route of the main trunk is below the skin, up between the rings to be lost up-on the superficial walls of the abdomen. These lymph-atic glands in the groin we know to be very sensible and as the ~~[illegible]~~ superficial alone have thus been sup-plied we must notice how those which are more deeply seated are furnished. These lie ~~not only~~ below both layers of the superficial fascia and are alike liable to become affected by the matter of syphilis from chancre upon the penis, thus giving rise to bubo, which however is much more serious in the latter than in the former as they ~~[illegible]~~ are very liable to leave a suppurating sinus leading down to the side of the pubic bone, which is very difficult to manage, and as they are bound down so much more closely by the fascia. These deep-er glands are supplied with blood by the next branches of the femoral artery. These are generally

three or four in number and are called the External Pudic arteries. They sometimes come from the profunda or sometimes from both and vary very much as regards size and number, as well as source. In this instance there are two coming off from the femoral which go to supply the deep seated lymphatic glands of the groin and the parts immediately surrounding, - and one large branch from the profunda which is distributed to the scrotum and penis. There is most generally one branch of considerable size sent upon the scrotum where it is so placed as to be exactly in the way of the trochar in the operation for hydrocele. It is doubtless often slightly wounded in this little operation, and sometimes is entirely divided giving rise to an inconven-ient and troublesome hemorrhage into the sack and the surrounding parts. I remember one case to which I was called by my friend Dr Rutter in which an ind-ividual was very subject to hydrocele, and was in the habit of tapping himself, which he had done one hundred and thirteen times, which by the way shows that simple tapping will not easily cure the affection; He was in the habit of performing this by means of a common thumb lancet and then squeezing the water out with his hands. In his previous operations he had held the lancet in a horizontal position, but changed it on this occasion for a vertical one, when he cut this artery directly off. The blood flowed into the sack until it had filled it up, and then infiltrated the cellular tissue of the scrotum, and finally that of the inner side of the thigh for some distance down towards the knee, and also extended upon the gluteal region. This considerably alarmed him and Doctor Rutter was sent for, by whom I was call-ed. After securing the vessel and discharging as mu-ch as possible of the effused blood from the surround-ing parts I concluded to leave that in the scrotum alone, where it finally became absorbed and prod-uced a radical cure of the hydrocele. Even had it not cured him, you may be sure that this would have been the patient's last attempt at tapping himself, so well was he frightened at the result.

The next ~~large~~ branch given off by the femoral artery is a very large one called the Profunda femoris. This is the muscular branch to the parts upon the thigh, and quits the main trunk, sometimes at the distance of only half an inch, but generally at about two inches from the lower margin of Poupart's ligament. The origin, and course of this great branch, are exceedingly various, it being however sufficient to remember, that in this neighborhood, whether by one or more trunks, is given off the arterial supply of the muscles of the thigh. The origin and course in the instance before us is about the normal standard, being at the distance of about two inches below the ligament, and the branch lying nearly or quite behind the main trunk, which proceeds straight on in its course down the limb. It has been recommended by some surgeons, in cases of wounds of the leg or thigh to take up the great vessel, between Poupart's ligament and the origin of the profunda, but it has been found that this course is very often followed by a fatal hemorrhage when the ligature comes away. This is doubtless occasioned by the reflux which takes place into the profunda and femoral below, by the anastomosing vessels, interfering with the formation of a clot by which to occlude the vessels. This back current almost always has this unfortunate effect when a large vessel has been tied in the vicinity of a branch, and hence such operations are generally avoided by all good surgeons, who in such a case as the one supposed would prefer to tie the external iliac, above Poupart's ligament, which would not be accompanied by the same inconveniences of branches being in the vicinity of the ligature. This great Profunda gives off numerous important branches soon after leaving the femoral, one going around the limb anteriorly called the anterior circumflex, another posteriorly called posterior circumflex, the latter of which forms anastomoses with the branches of the internal iliac. These circumflex arteries which we shall have to examine more closely hereafter, however, sometimes come off from the femoral itself.

Lect. LII.

At the conclusion of the lecture of yesterday, gentlemen, I exhibited to you a very large arterial branch coming off from the femoral below Poupart's ligament designed, as I then told you, to supply the great mass of muscles upon the thigh. This from its running very deeply in limb, was called the profunda femoris. We noticed then that the normal position of this trunk was directly behind the femoral during the principal part of its course, - and that the exact point at which it left the great vessel was very various, having an ordinary latitude of from half an inch to two inches. Although the ordinary position of this profunda is behind the femoral, yet it is very frequently found to the inner side, and sometimes almost upon the same level with it. We also noticed at the close of the lecture, that this profunda gave off two branches of considerable size soon after its origin, - for the supply of the parts surrounding the hip joint. From the circumflex course of these vessels around the joint they have received the name of Circumflex arteries, and from their course around the bone, one before and the other behind it, they are distinguished as anterior and posterior. Wherever we have a joint or movable articulation about any part of the body, where much motion is effected, there do we always find either circumflex or recurrent arterial branches, by which the parts are copiously supplied by arterial blood for this it is which forms the pabulum of the synovial secretion which is so necessary to the free motion of the parts, by the lubrication which it accomplishes. The external circumflex running around the anterior face of the limb in a direction towards the great trochanter, after giving off numerous branches to be hereafter noticed, anastomoses with a branch of the gluteal artery which as we shall see is a branch from the internal iliac, and the internal also, after winding backwards around the lesser trochanter, anastomoses with a branch of the same gluteal. Thus we see another of these important means by anastomoses, from which so much advantage is derived in obstructions of the main trunk and by this a full supply is always ensured to the important structures composing the joint. We have

the subject here turned upon its abdomen and will now take a glance at the vessels supplying the upper back part of the thigh and pelvis, which anastomose with those just noticed, and which come off from the internal iliac inside the pelvis. Here, when we reach the Gluteus maximus muscle which we have before studied as covering the back portion of the thigh and pelvis we expose a portion of a smaller muscle which we have examined as the pyriformis. This it will be remembered comes from the sides of the three middle bones of the sacrum, by their internal face, from which the fibres converge so as to form a muscle of a pear shape, these we found, escaped from the pelvis through the greater sacro sciatic foramen, and were inserted into the digital fossa at the foot of the great trochanter. Now above this muscle, as it escapes through this foramen, - and closely embracing the bone, we have coming out a large arterial trunk, a branch from the internal iliac, which in consequence of being distributed mainly to the gluteal muscles, is called the gluteal artery. Emerging through this greater foramen below this same muscle we have another large trunk, also a branch of the internal iliac, called from its proximity to the great sciatic nerve, the sciatic or ischiatic artery. There is also another branch with which however we have now little to do, except to mention. This is the internal pudic artery; it comes out with the sciatic through the greater foramen, but keeps close along the bone embracing the spine of the ischium, and gets back into the pelvis again through the lesser foramen giving no branches to, or otherwise concerning the outside of the pelvis, being distributed entirely to the perineum and viscera of the pelvis, and for this reason concerning us no further to day. Now these arteries, upon the back part of the pelvis are sometimes the subject of operations of various causes, and are therefore necessarily to be carefully studied. On the ischiatic we occasionally have aneurismal tumours developed which require that the vessel should be cut down upon in order to throw a ligature around it, and the gluteal although not subject to aneurism like the

other, is frequently wounded in accidents involving as is often the case, the fleshy part of the hip, Being a vessel of large size, it would under such circumstances require to be tied immediately to prevent a fatal degree of hemorrhage, In these operations it is of course necessary to have some guide by which to know where the vessels may be found, and for this purpose certain rules have been laid down, For such an operation the patient would be laid upon his abdomen, - the leg and thigh extended and the toes turned slightly inwards, In this position the trochanter major, the tuberosity of the ischium and the posterior superior spinous process of the ilium are all accessible points and readily felt through the soft parts. If we then draw a line from the tuberosity of the ischium to the trochanter major, and mark the middle point upon it, - and then draw another from the posterior superior spinous process to this middle point, it will run directly over the point at which the gluteal emerges from the pelvis, - and if this line be divided into three equal parts the point will be found at the junction of the upper with the middle third The other artery will be covered in the first part of its course by a line drawn from the sacro coccygeal articulation to the trochanter major. To reach them we must of course cut through the skin superficial fascia the fascia lata and the Gluteus maximus muscle Coming out of the foramen with the gluteal artery we have a corresponding vein and nerve which branch in nearly the same manner with the ~~vessels~~ artery itself, thus following the general rule and requiring but one demonstration, Shortly after appearing upon the outside of the pelvis this artery gives of several branches varying in number as well as size, The first is generally of moderate size and distributed to the gluteus maximus principally, the branches having here been divided in order to turn of the muscle from its seat. Another branch of larger size is thrown sent to ramify between the medius and maximus, supplying the under face of the latter, and a great number of small branches to the medius, This is sometimes called the posterior branch, The terminal branch

which is larger than any of the others, runs along the curved ridge upon the dorsum of the ilium, between the origins of the medius and minimus muscles to each of which it distributes a great number of small branches all the way along its course between them. This artery also supplies a number of small branches to the bone which has the greater part of its nutritious foramina upon its outer surface. As this artery gets to the anterior border of these muscles in its course between them it branches and surrounds by its branches the hip joint to which it furnishes some ramuscules, and anastomoses as before noticed with the circumflex arteries from the profunda femoris, thus forming the connexion at this point between the internal and external iliacs.
The ischiatic artery from which the internal pudic before mentioned, is a branch coming off however within the pelvis, — gets out below the pyriformis muscle, and proceeds outwards towards the great trochanter first, and then downwards between it and the tuberosity of the ischium, in company with the great sciatic nerve. It lies immediately below the gluteus maximus and the fatty matter upon the buttock, in the deep sulcus between the bones of the pelvis and that of the thigh. The first branch which we notice from this vessel pierces the great sacro ischiatic ligament and gets to supply the coccygeal and levator ani muscles within the pelvis, and this is called the coccygeal branch. One or two others of small size are also given off to the gluteus maximus muscle, and another to the lower part of the pelvis where it anastomoses with branches from the internal pudic. The terminal branch attends the great sciatic nerve to a considerable distance down the thigh, in some instances being traced down to near the knee joint. This sends off a great number of ramifications in its course, many of which anastomose with the circumflex arteries of the profunda femoris. We may now reverse the subject and examine more carefully into the seat and distribution of the circumflex arteries whose position we have already superficially glanced at.
The great profunda we have seen upon the prepara

-tion, occupying its natural position with regard to the femoral; from which however, upon the subject here it departs considerably. being here divided into three br-anches of nearly equal size, the middle being much smaller than is ordinarily found to be the case, which is accounted for by the occurrence of a large branch from the trunk of the femoral a little farther down which seems to supply a part ordinarily furnished from this middle branch of the profunda. This trunk is also situated further towards the inner side of the thigh than is usual with it. The first of these two lateral branches from the profunda, which we shall notice is the external circumflex. This passes outward under the sartorius muscle ~~to~~ which it gives a branch, then between the rectus and cruralis muscles, to the first of which it also gives a branch. It then sends off a long branch down the outside of the thigh betw-een the vastus externus and the fascia, which anastomoses after giving off ramifications in its route, - with some of the vessels surrounding the knee joint. The continuation of the trunk then continues in a transverse direction until it arrives at the trochanter around which it as-cends to anastomose as before seen with a branch of the gluteal. In this course it sends branches to the capsule and also to the head of the external vastus. some of which anastomose with the perforating arteries and supplying some ramuscules to the gluteus max-imus muscle. All these branches then coming from the femoral artery might be controlled by pressure upon this vessel as it passes under Pouparts ligament in case of wounds or amputation at the hip joint. so as thus far to prevent hemorrhage from taking place, but the inosculations with the gluteal and ischiatic would give ~~rise~~ rise to it from this sou-rce, which not being under the same command and might give rise to some embarrassment as they could not be controlled except it be by the hand of an assistant upon the abdominal aorta above its bifurcation into the iliacs. Upon the minute and particular distribution of the smaller branches I do not dwell, because the anomalies are so numerous

as to render a knowledge of any particular one of no use, a general knowledge only being required for practical purposes, without endeavoring to retain minutiæ which are almost impossible, as it is useless. Upon the inner side of the limb we have the internal Circumflex the other branch from the great profunda. This vessel keeps more close to the bone and is distributed to the joint more particularly. It is sometimes found smaller than the other although here of about the same size. It runs around between the psoas and pectineus muscles towards the lesser trochanter, in which part of its course it here sends off one of the external pudic arteries before mentioned. It here also sends a considerable branch to the obturator externus muscles which after supplying that muscle seems to be continuous by a large branch with a portion of the obturator artery which has been before noticed as a branch of the internal iliac coming out of the pelvis through the obturator foramen, thus forming another of those compensating anastomoses of which we have spoken. The artery afterwards sends off many small branches to the heads of the adductor muscles which arise from the pelvis at this point. After sending a number of branches to the hip joint the main trunk of the artery then runs on to anastomose with the branch of the gluteal before noticed. We next turn our attention to the direction of the femoral itself which in this case gives off the largest of the perforating arteries as they are called. These generally come from the profunda, and vary in number from two to four. In the present case we have them in all two coming from the profunda as usual and the other large one from the femoral itself. These branches are properly called perforating as they perforate the adductor mass of muscles to which also they give branches, and get by this means through onto the back of the thigh where they after perforating the adductor magnus, are lost in the Biceps and semitendinosus and semimembranosus muscles, which thus get their supply of arterial blood. Some of the branches however get down to anastomose with the

circumflex arteries of the knee joint, We next come to trace down the main trunk of the femoral until it loses the name in the popliteal region and takes that name instead, This course has been before alluded to at such length that it is not now worth my while to spend much of your time by a repetition, Suffice it to say that the course is somewhat spiraly inwards in which the vessel is covered in the middle third of its course by the sartorius muscle, being above and below this only covered as you see by the sartorial portions of the fascia lata with the adhesive matter and integuments, The vessel thus lies upon the inner side of the muscle above and at its outer edge below at either of which points it is readily accessible to the ligature, At the junction of the lower third or fourth of the thigh with the next succeeding portion, the vessel disappears from view, upon the inner posterior face of the bone, with which it here lies nearly in contact. This is in consequence of the artery piercing the tendons of the adductor longus and magnus to gain in an oblique direction the back upper part of the popliteal space where it is no longer femoral but popliteal artery. Before piercing these tendons however the vessel gives off an important branch of considerable size called the anastomotica, This is exactly analagous to that which we found upon the arm And is distributed to the vastus internus in part, whilst the remaining branches follow down the tendons of the adductors to the condyle and ramify around it, anastomosing with the circumflex arteries of the articulation of the knee, The great trunk after becoming popliteal in the region of the knee, runs downwards through the middle of that space until is gets below the articulation of the knee where it divides into two branches an anterior and a posterior tibial, the latter of which soon throws off a large branch called the peroneal or fibular artery from its course along the bone of that name, whilst the posterior tibial itself runs along the edge of the tibia between the two bones The anterior tibial pierces the interosseous ligament to get upon the anterior part of the leg, just below

the head of the tibia, To avoid turning the subject over again at this time we shall now take up the consideration of this Anterior tibial Artery and trace it down upon the foot leaving the more precise study of the posterior branches for the next lecture, We here notice the same system of anastomoses around this joint in the recurrent branch which the tibial sends up near the knee joint, This Anterior Tibial vessel is one of considerable size lying upon the interosseous ligament between the bones of the leg, and upon the outer side of the tibialis anticus muscle along which it generally descends to the foot, In the case before us however we have an interesting anomaly in this course, The artery here dwindles away as it descends until it is lost before it reaches the ankle joint, giving branches to the muscles in its course. Just above the joint however, its place is supplied by the peroneal, which larger than usual pierces the interosseous ligament to supply the ankle joint and dorsum of the foot. The normal arrangement is seen here upon this dried preparation where we shall be better able to trace it out, as we may also do upon these beautiful plates, where they are minutely coloured, We see then that it is here descending along the side of the muscle giving off branches all the way down to the ankle ~~knee~~ joint where it sends off some of greater size by which with some from the posterior arteries the articulation is plentifully supplied with blood, which as it is extensive demands a very large quantity, We then have the anterior tibial becoming the dorsal artery of the foot, from which is sent off first the tarsal artery over the bones of the tarsus to supply the ligaments and joints, - then the Metatarsal artery which makes a curve over the metatarsal bones, from which are given off branches to supply each side of the smaller toes in precisely the same manner that we found in the case of the fingers, The terminal extremity of the artery then after sending off a branch called the dorsalis hal- pierces through and gets upon the sole of the foot where it anastomoses with the terminal branches of the posterior arteries,

Lect. LIII.

There is still remaining, Gentlemen, a few more words to be said upon the Arteries of the lower extremity, which we had not time to finish at our meeting of yesterday. You will remember that we then traced down the femoral artery until we found it disappearing from view through the tendons of the adductor muscles, - noticing that at the point of emergence through these tendons below, say the junction of the lower with the next fourth of the femur, - it lost the name of femoral, and took that of popliteal. Now this term popliteal is synonymous with ham and is also applied to the space before spoken of, as lying between the margins of the hamstring muscles, and the heads of the gastrocnemius externus muscle, and being of a lozenge or diamond shape. This space is bounded in front by the face of the expanded portion of the thigh bone, - the posterior ligament of the joint and the ligamentous matter covering the heads of the bones of the leg, and forming a part of the tibialis posticus muscle. In the normal state this is filled up by a mass of fatty cellular tissue which is covered in and confined by the popliteal portion of the great fascia lata of the thigh. Entering this region from above, the artery passes obliquely across the bone downwards, through it. This crossing of the artery over the bone is not in consequence of an oblique direction of the vessel, which on the contrary runs very nearly straight down, varying only slightly from a straight line between the middle of Poupart's liga-ment and the knee. The obliquity is due to the direction of the bone which as you know approaches the median line from the trochanter major to the knee, in conseq-uence of being there separated widely from it by the neck of the bone. In this course through the space we find the artery accompanied by its vein as is general-ly the case throughout the body, in the smaller vessels however there generally being two, called in that case venæ comites. And also accompanied by the divi-ded sciatic nerve, for, at the upper extremity of this space generally, although sometimes much higher up we have the great sciatic nerve dividing into two branches the one of which goes to the outer side of the limb and is called peroneal, the other to the inner, and called

popliteal, being the largest or rather a continuation of the main nerve. In this course through the space the popliteal nerve is found most superficial, forming when the leg is fully extended, a hard cord which may be felt through the skin. Next below this we find the vein, and deepest of all, lying within a short space of the bone, we find the artery. As this passes between the condyles it throws off the first branches of any importance, - the small muscular ones along the course having received no names, and being very various. The whole of this popliteal artery therefore you see is accessible and may be cut down upon although the operation is generally regarded as injudicious from the proximity of the joint which is thus liable to be inflamed. The operation may be so performed by cutting down between the heads of the gastrocnemius, as to take up either the anterior or posterior tibial vessels at their place of origin, but this also has the same objection of being too near to the inflammable structures of the joint.
In this course through the popliteal space the artery gives of no branches except those to the joint and to the heads of the gastrocnemius muscle, which have received names or descriptions. The first of these which we notice are the superior and inferior internal articulating arteries of the joint, from the superior of which is given off the azygos or middle artery of the articulation. This however is an anomalous source for this branch, generally coming off as it does from the trunk of the popliteal by a separate head. The superior internal artery takes a direction somewhat upward and inward almost in contact with the bone, branching in various directions, many of which pierce the capsular ligaments to supply the synovial membrane not only of the knee ~~joint~~ but also of the great bursae which exist beneath the tendons of the quadriceps extensor muscle. A great number of these branches also are joined to the anastomotica which we have seen coming down from above, - and these big vessels the size of knitting needles. We next have the azygos or middle artery piercing more nearly the line of the articulation and plunging at once into the posterior ligament of the

joint, by which it gets at once into the capsule and is distributed to the internal structures, The inferior internal artery comes off below the others and takes a somewhat downward course over the head of the tibia and the capsule surrounding it, through which its branches pierce to reach the synovial membrane, This vessel not only anastomoses with the superior internal above, but also with the recurrent tibial below. Upon the outer side of the limb we have also two branches coming off named similarly to those already noticed, and distributed in the same general manner, as for instance you see here the superior external surrounding the joint below the hamstring tendons, sending off one branch to run under the patella, and another preserving nearly the direction of the joint into which it is constantly sending off small ramifications through the ligamentous structures to which it is attached, branches from this vessel anastomose with the anastomotica and also with branches terminating that which we noted coming down the outer side of the thigh from the external circumflex artery of the hip joint, The inferior external artery is of smaller size, taking however a corresponding direction to the internal one and distributing itself in pretty nearly the same manner, except that it forms anastomoses with the recurrent fibular instead of the recurrent tibial branches, being also distributed in small measure to the external head of the gastrocnemius, Thus we notice a very free and large anastomotic connexion between all the arteries surrounding the joint, which are also noticed to be very numerous and of considerable size, The very large quantity of blood which is thus thrown with such facility upon the joint will very reasonably account for its liability to inflammation, and show us at once how careful we should be in giving occasion to the establishment of such an action under these predisposing circumstances, and where else it leads to such unfortunate results, As we pass down we next come to two branches of nearly equal size given off at opposite points, to supply the two heads of the gastrocnemius muscle. These are called the

gastrocnemii or Crural arteries and take a course down through the respective parts of the great mass of muscles which they supply, They are as you see of considerable size, - indeed so large that in amput-ating the leg at the place of election below the head of the tibia, they will require the application of the ligature in order to prevent troublesome hemorrhage As we now pass on still lower we find the poplit-eal artery dividing and loosing the name, It here is separated into two large trunks the anterior and posterior tibial, The anterior with its corresponding vein and nerve passes through an opening in the inter osseal ligament to gain its position in front of this membrane, The opening through which it passes ap-pears, and is in fact too large simply to admit it, but this space was necessary to prevent the chance of its compression in the motions of the limb or its muscles This artery after getting onto the anterior side of the interosseal ligament is distributed down upon the ant-erior muscles of the leg, of the foot and finally by an arch to the toes, and a branch through onto the palmar surface, all of which were particularly noticed yes-terday, We next continue with the posterior tibial branch, which we find shortly after its origin thro-wing off a large branch called the peroneal or fib-ular artery, In the instance before us there occurs here as noticed yesterday, a very interesting anomaly The fibular in this case instead of being a branch of the posterior tibial, appears as the main trunk, the other being much the smaller, - which after passing down towards the ankle joint pierces the interos-eous ligament and gets upon the dorsum of the foot to supply the defect created by the failure of the anterior tibial to reach so far down on its natural course, The Normal condition of parts however this fibular artery is smaller than the posterior tibial, and runs down upon the tibialis posticus muscle, along the edge of the fibula, and imbedded in the long flexor of the great toe, About the lower third of the bone it usually divides into two branches, one of which the anterior peroneal, soon pierces the interosseous lig

and is distributed to the parts in the neighbourhood of the ankle joint, anastomosing with the branches of the anterior tibial. The arrangement in the anomal-ous case before us offers another illustration of the fact heretofore mentioned, namely that however the vessels may be divided as to service their ultimate terminations in particular tissues or parts is still the same as in other cases. The other or posterior peroneal branch is continued on down behind the external malleolus and is distributed to the external part of the dorsum and side of the foot. The posterior tibial after throwing off this branch usually procee-ds down the leg upon the tibialis posticus and flex-or communis muscles, near to the other artery, but keeping close to the edge of the tibia, giving of in its course small branches to the muscles and bone, until it reaches the sinuosity of the os calcis behind the internal malleolus, through which it proceeds giving off a branch to the mass of fatty matter whi-ch we find upon the heel. After passing under the ligament of the joint and between the abductor muscle of the great toe and the bone, it divides into two branches, an internal and external plantar arteries. The internal plantar artery is the small-er of the two and supplies the inner surface of the foot and the muscles of the great toe lying placed pretty deeply. The external plantar, much larger in size runs deeply across the foot outwards giving branches to the structures through which it passes until it gets to the outer side where after sending a branch to the outer side of the little toe it bends inwards and forms the plantar arch, anastomising at the inner side with the branch from the anterior tibial before noticed as coming through to the sole. This arrangement we see corresponds exactly with that which we found upon the hand in the anastomoses of the radial and ulnar arches by means of a communicating branch between but unlike the hand we have here but one plantar arch, whereas we there noticed two a superficial and deep seated. Again in correspondence with the hand we have the arch

throwing off branches, which again dividing, supply the opposite sides of different toes, in such a manner that each side gets a branch. From these arteries we have given off also branches which dip directly down between the bones to the interosseous muscles, - called the plantar perforating arteries, - and also a number from the dorsal arteries with the same destination. This then finishes the consideration of the arterial distribution to the lower extremities, and numerous anomalies witnessed in the subject before us, will give you a lesson as regards the distribution, which may tend to lessen your embarrassment upon cutting down and not finding the vessel which your correct anatomical knowledge taught you to look for in the position taken. Bearing these anomalous distributions in mind, it is always proper to take every means in your power to ascertain the existence of a vessel before cutting for it, - by feeling for it through the skin, and tracing out the neighbouring superficial vessels, to detect any variation in them by which you may be guided. We next come to the consideration of the nerves which are supplied to the lower extremity. These consist in two great trunks, one anterior called the crural, and the other posterior called the great sciatic, which is the largest nerve in the body. Both of these are derived from the same source, namely the ~~lumbo~~ sacral plexus which we must now examine with regard to its formation, and as the crural nerve comes off from the plexus first, it must first claim our attention in description. We have already traced the roots of the nerves as they had their origin from the spinal marrow, which structure we have also studied at some length. We have seen how the superior and inferior cervical plexuses were formed and traced out the nerves originating from these and we have seen too the intercostal nerves which are smaller, one coming from each vertebra of the back so that there are twelve in all, and these twelve occupying the twelve spaces between the ribs all the way down from the cervical plexuses to the

lumbar region, Now after these there are, a part of the last dorsal, - the whole of the five lumbar, and generally five or six sacral nerves, all of which go to the formation of this lumbo sacral plexus from which are supplied the lower extremities, The last dorsal and four upper lumbar being concerned in the formation of the anterior crural, whilst the lower lumbar and the sacral branches form the great sciatic, To enable us to start upon this demonstration with clear ideas of the distribution of these branches, it will be well to recal some of the peculiarities of the arrangement of these nerves, which have before claimed our attention Thus we have noticed that after the emergence of the nerves between the vertebra they divide into a posterior and anterior branch, - the former disappearing from view immediately through the muscles to supply those upon the spinal region or back, whilst the anterior were continued on between the ribs to supply the muscles and other structures upon the chest to the middle line of the sternum where the stopped short for there is reason to believe that the nerves of one side do not extend even the eighth of an inch onto the opposite side of the body, and this more from pathol-ogical evidence in which they were concerned, than from dissection, by which it is impossible to trace out such minute ramifications with the eye, Cases of hysterical neuralgia have however occurred in which the affection did not extend for a single line apparently, over the middle line of the body other diseased conditions also tend to the same deduc-tions, Now this same division of branches holds good with regard to these lumbar and sacral nerves each sending its branch backwards to the muscles upon the back, whilst the anterior go to the form-ation of the nerves which we are about to consider The last dorsal which is here cut off from the spine exhibits this division in the nerve clearly, where one branch runs back to the spinal region, whilst the other aids in the formation of the plexus, - We notice here two other branches of this nerve which however belong to the great sympathetic, the connexion of

which with these I do not now wish to embarass you, as we shall have to consider it at a future time in connexion with the viscera, These two branches run as you see to one of the lumbar ganglia of this nerve. From the upper part of this lumbar plexus then we have first two branches given off called the musculo cutaneous on account of their distribution to the muscles and skin. The first of these is the largest and longest, It pierces the tendon of the transversalis muscle and then sends a branch to this muscle and the oblique and between them also a branch to the rectus. Many other of its branches pierce the muscles and get to the skin forming those little foramina in the tendons which we have seen when considering these expansions, There is also a branch from this nerve sent over the crest of the ileum to be distributed upon the outside of the pelvis. The second of these nerves is smaller of the two, and supplies also the muscles of the abdomen but at a point lower down than the other. This sends a branch across under poupart's ligament from the superior anterior spinous process down upon the superficial integuments of the scrotum, and is hence called the ileo scrotal branch or sometimes the external spermatic nerve, - This upon the female is distributed upon the labia pudendum and neighbouring parts Another branch from this lumbar plexus is called the Genito Crural nerve, This pierces the body of the psoas magnus muscle and runs down to the groin where it divides into two branches, one of these called the crural branch runs out and down the thigh to the muscles and integuments there whilst the other gets out through the spermatic canal and goes down to be distributed to the cremaster muscle and other appurtenances to the genital organs, and hence the appropriateness of the name In practice you will often meet with painful affections of these parts, which if carefully traced by your anatomical skill will be found to follow the course of one or the other of these nerves, and to constitute a neuralgia of the parts, which under other circumstances would not be recognised at all, and your usefulness as a physician thereby limited or prevented.

**Lect. LIV.** We were engaged yesterday as you will remember, gentlemen in the formation situation and distribution of some of the various branches of the lumbo-sacral plexus of nerves, We did not at that time, as is most commonly done in description make any division in this great plexus of nerves, considering them for the sake of perspicuity, as a single great plexus formed of the lower dorsal and lumbar and sacral nerves, In the books this is divided into two, - the lumbar and - sacral plexuses, - the first being formed by the union of the last dorsal and the four upper lumbar roots interlacing and branching to form a net work or plexus, The sacral being in the same way composed of the last lumbar and the sacral nerves, These two are however intimately connected, and as they go to supply a continuous and defined portion of the body, and cannot then be readily separated, it is best that they should be considered as a single plexus, The parts to which these as a mass are appertained, are the abdominal muscles, pelvis, and lower extremities, there being in all this extent no physiological division, From this large plexus there proceed a very great number of nerves, the best way to remember the general arrangement of which, is to associate them with the parts to which they are principally distributed, and the functions which they perform, In this manner I have endeavoured to arrange the description of them and in carrying out the plan we yesterday commenced the consideration of some of the uppermost divisions of these nerves, We commenced then by remarking that these roots which go to the formation of these, have as we saw in the intercostals their lateral branches which turn backwards to supply the back lumbar region and the integuments over the side and back, and also some branches distributed over the pelvis, We then took up the two first nerves proceeding off from this plexus namely the two musculo cutaneous, one of which is found longer and larger than the other and distributed to the muscles and integuments of the abdomen some branches even reaching around onto the rectus muscle, and the other to the same muscles and integuments although lower down, - a principal branch from which

we however traced across from the ilium onto the scrotum and hence called ilio scrotal, we saw indeed that the whole nerve from this fact was sometimes called ilio scrotal. The office of these nerves then being the common one of supplying the muscles and integuments of the lower quarter of the abdomen and scrotum, they were very well associated together at the commencement, as a starting point. There are sometimes three of these musculo cutaneous nerves distributed here, but ordinarily as in this case only two are found. We then came to another nerve coming off a little lower upon the plexus, called the genito crural. This we found as it got down to Poupart's ligament dividing into two branches, one of which was distributed to the muscles and skin upon the anterior part of the thigh near the groin, and the other passing down through the inguinal canal to be distributed upon the cremaster muscle and the surrounding tissues. These then side branches from the lumbar plexus were then finished, and now with the remark that all these send off in their course small branches to the psoas and iliacus muscles, we come to the consideration of the terminal branches of this lumbar plexus, or rather the main trunks which are formed by it. Beneath the psoas magnus and to its inner side we have here two large nerves passing downwards towards the pubes. These are the anterior crural nerve and the obturator, the latter of which although quite a large branch is much smaller than the anterior crural. And we have here also another very large branch which passes from the lumbar to the sacral portions of the plexus, joining them is[illegible] -ually together and constituting thus one, rather than two plexuses. The obturator nerve which I have run up, passes downwards along the brim of the pelvis or ilio pectineal line with the obturator artery which we have before noticed, until it arrives at the foramen through which that vessel passes, passing with it to get out upon the thigh. Before it enters the foramen it gives off a branch which goes to supply a portion of the obturator internus muscle, the remainder of its nerves coming from the sacral plexus down in the

pelvis. The main trunk of the nerve then appears out side the pelvis, and is distributed as we shall hereafter see upon the inner side of the thigh. The larger branch which is the proper anterior crural nerve, gets beneath the psoas muscle to its outer side down which it takes its course being separated from the external iliac artery by the breadth of the psoas muscle, until it emerges beneath Poupart's ligament in the notch between this and the iliacus internus muscle. This nerve is appropriated to the anterior, internal and external muscles and integuments of the thigh, in supplying which it is aided by the obturator and one branch of the genito crural. We shall now take up this nerve and consider its branches in the order in which they are given off. The first of these is given off up in the pelvis and is called the external cutaneous branch of the anterior crural, and as it is distributed almost wholly to the skin it must necessarily consist of sensitive filaments principally, as motion is not exerted in the skin. This separates from the main trunk and issues under Poupart's ligament near the superior anterior spinous process, from which it is distributed over the outer and front portions of the thigh, principally over the vastus externus muscle. There are occasionally other branches found coming off inside the pelvis but in this case, the one first mentioned is the only one discoverable. The obturator nerve after getting through the foramen with the artery pierces the adductor mass of muscles, lying beneath the pectineus, giving first some branches to the obturator externus muscle, then to the adductor brevis, and successively to the longus and magnus, with one also to the gracilis muscle, all of which thus get a great part of their muscular influence. The terminal branch may then be traced down along the inner side of the leg as far as the knee joint to which it sends many branches and anastomoses with other surrounding nerves. By raising up the pectineus muscle from its seat we see that beside a branch to this muscle, there is also one of considerable size which pierces the capsular ligament of the joint to be distributed to the

parts within the joint, Now this connexion with the hip joint above, and the anastomoses with the short saphenous nerve below, to supply the knee joint is worthy of examination, as accounting in a manner for a phenomena heretofore unexplained, and about which much controversy and difference of opinion has existed, It is well known that in the commencing stages of Coxalgia, a pain is felt, - not in the hip as would be supposed, - but in the knee of the correspond-ing side, This singular symptom is an almost constant one, in the forming stages of the disease, and when present is regarded as one of the points in the diagnosis of the affec-tion, It may be explained only by supposing this nerv-ous connexion between the joints to be the effective agency. For instance any change in the ordinary condition takes place which is capable of causing pain, - this becomes a positive sensation by being conducted to the brain, and by being transmitted along this branch of the obturator nerve to the centre, is referred by it not in the direction of this branch, but in the more direct line of the long terminal extremity of this nerve which is distrib-uted around the knee joint, This being occasioned as it were by a mistake in the great sensorium in referring it to another part from that to which it rig-htly belongs, - when in fact that part is not at all implicated in the disease, We now return again to the Anterior Crural nerve, This external cutaneous which we have observed coming out near the spinous process of the ilium is distributed as you may see over the whole external part of the thigh; - the numerous branches here dissected out, not being the one hundredth part of the whole number into which it is divided, they being distributed to all the parts surrounding, We now come to consider some other branches of the crural, we notice that immediately upon getting under Poupart's ligament it sends off a shower of branches all over the thigh - or rather it appears to be entirely divided into these, There are usually two or three branches given off next to the external cutaneous which are collectively called the middle cutaneous branches, but by many have been named, the most external one the anterior cutaneous

the next, the middle, and another inside, which is smaller, the internal, - from the position which they occupy, - and being principally distributed to the skin upon the anterior portions of the thigh down to the knee joint. In addition to these there are two large branches coming off more internally called the short and long saphena nerves. The long Saphenus or Saphenus internus, or major, is the largest branch which we have had to consider and coming off from the crural beneath Poupart's ligament, gets immediately into the sheath of the vessels, in which it continues its course down to the point at which these pierce the tendon of the adductor muscles. This is the nerve which it is so necessary to avoid tying in the operation for ligation of the artery in any part of its course along the thigh, - as this would give rise to paralysis of the inside of the knee leg and foot. At the point where the vessels enter the adductor tendons, this nerve leaves them, still following its course down over the adductor magnus, until at the knee joint it gets to be more superficial, passing round the joint, and emerging under the tendon of the gracilis, or between that and the sartorius, sometimes piercing the latter. It then gets upon the leg, in company with the internal saphenus vein, to the sheath of which it adheres almost inseparably all the way down the leg. This Saphenus vein is made up of a collection of the veins upon the inside and dorsum of the foot, and ascends by the internal malleolus up the leg and thigh, emptying into the femoral at the groin, as we have seen in the study of crural hernia, - through an opening in the fascia lata for that purpose. The nerve then divides with the vein as it gets down upon the foot, and is thus distributed over the inside and dorsum. It gives off branches to the integuments surrounding the knee joint, supplying also some of the structures of the joint. As it here becomes enlarged, as is usual with nerves distributed to a joint, - As you see, the enlargement is considerable when it is compared with the size of the trunk above. The nerve and vein do not come together until they have

passed some distance below the knee joint, and this relation which they bear to each other here is important to be born in mind, as it affects an operation which is sometimes necessary to be performed in this region. In obstinate varicose conditions of the veins of this region, it sometimes becomes necessary to occlude one of the superficial ones, and this is generally the internal saphenus. This is accomplished by a ligature, or what is much better by passing a pin under the vessel and strangulating it by a ligature cast over the ends of the pin, — and should be done in the position indicated, below the knee joint as then the nerve would not be included, as would almost necessarily happen if attempted at a point lower down upon the limb. The Short Saphenus nerve, which is given off nearly at the same point with the one last considered, proceeds down the thigh as the other did and is distributed to the parts surrounding the knee joint, anastomosing with the obturator, and other branches, and supplying the muscles about its point of distribution. This nerve never descends below the knee joint and is therefore called short, to contradistinguish it from the other which we have traced down to the foot and ankle. In addition to these we have a great number of muscular branches coming off from the crural at its branching point, — some of which I raise up, others being more deeply seated. These have received no particular names, as a knowledge of them is of very little practical importance, except that by which we learn that every muscle must be supplied in the same way and with the same necessity as we saw there was for arterial blood, when studying the vessels. We now see what portion of the limb is supplied by the Anterior Crural nerve and its very numerous branches. The outer or external, — the anterior and the internal faces, as low as the knee joint, — and the inner face of the leg all the way down to the foot, which also receives a part of its supply from this source, and we have next to enquire into the manner and source of the supply to the remaining portion

of the limb, and must commence with an exam-ination of the Sacral plexus, from which we already know the nerves to be derived. The roots which arise from the spinal cord to form this plexus, exist with their ganglions upon them, already formed in the canal of the spinal column forming the cauda equina, which as we have already seen is a divided prolongation of the spinal marrow, the true spinal cord terminating as it does opposite the first lumbar vertebra. These nerves as in other parts of the body have their two divisions, one escaping through a posterior foramen upon the lower part of the back and pelvis, the other coming through the anterior foramina to form the sacral plexus. This plexus therefore consists of the anterior branches of the last lumbar and four or five upper sacral nerves, receiving also some filaments from the lower nerves of the coccyx and sacrum, which generally go to the formation of the Hypogastric plexus, with branches from the great sympathetic system. From this sciatic plexus then thus composed, we have several nervous trunks given off beside the great terminal branch which constitutes the sciatic. The roots which form this do not always all unite inside the pelvis, but generally most of them do. We now turn the subject over and thereby get a posterior view of these nerves which we have seen formed within. Before the formation of the great sciatic from the plexus, a very considerable branch is given off from it which passes out of the greater sacro-sciatic foramen above the pyriformis muscle with the gluteal artery, branching ~~with~~ the branches of this vessel, and going to supply the same parts, supplying a portion of the gluteus maximus, as well as the medius and minimus. This is one of the lateral branches from this plexus of which there are yet two others to be noticed. The next of these issues from the same notch below the pyriformis muscle along with the ischiatic artery and is called the ischiatic or lesser sciatic nerve. This accompanies the ischiatic artery and branches with it in the same manner as noticed in the gluteal nerve thus supplying a portion of the gluteus maximus muscle and sending also a long branch down the back of the thigh as far as the knee joint, where it is distrib-

-uted in a manner which we shall hereafter have to notice, This is called the posterior cutaneous nerve. Another branch from this same ischiatic nerve is given off at an early portion of its course and winds around the tuberosity of the ischium to be distributed upon the perineum scrotum and other superficial parts in the neighbourhood, This is the perineo cutaneous or perineal nerve, and is the smallest of the three branches of the lesser sciatic, - The third and last lateral bran-ch from this sacral plexus is called the internal pudic. This joins the internal pudic artery and with it passes out through the greater sacro sciatic foramen and enters again between the ligaments through the lesser foramen, From this point it passes along with the vessel still, behind the edge of the ischium to be dis-tributed in branches across the perineum, to the muscles and other structures, also sending a branch to the rectum called the hemorrhoidal branch. It then divides into two main branches, one of which is supplied to the bulb of the urethra and corpus spongiosum through which it ramifies minutely, this is called the bulbar branch, The other proceeds up giving some branches in its course, until it reaches the dorsum of the penis upon which it is very minutely distributed, the two of the opposite forming a net work around the organ many of the branches being appropriated to the skin of the organ, The cutaneous nerve of the perineum is distributed however to the principal part of the integuments in this neighbourhood, These nerves many of them will have to receive a more particular attention at a future period, being just sketched out at this time to fill up the general history of the various large trunks from which they are all derived, thus preparing you for a second stronger impression when their relation and function in particular organs comes to be the subject of our particular study.

Lect. LV.

We were engaged at the last lecture gentlemen in the consideration of the formation termination and function of the lumbar and sacral plexuses of nerves, when the observation was made that the last sacral and coccygeal nerves were distinct from this plexus, and were concerned in supplying the viscera of the pelvis, with the hypogastric plexus, We then examined the situation and destination of a number of the branches of this plexus, to wit, first the two musculo cutaneous, - genito crural, obturator and anterior crural which come from the lumbar, and the gluteal, ischiatic and internal pudic from the sacral plexus. The gluteal which we found distributed upon the posterior part of the pelvis, followed in its branching the course of the artery, which is an interesting fact as it exemplifies a general ~~fact~~ law which holds throughout the economy of the distribution of vessels and nerves, We then noticed the lesser sciatic or ischiatic, found it divided into three principal branches, one continued down the back part of the thigh called the posterior cutaneous, - where it was distributed to the superficial tissues in its course so far as the knee joint, - another called the ischio perineal, or internal cutaneous, which supplied the integuments upon the perineum and sent a branch over the scrotum in the male and the labia pudendum of the female, winding around the tuberosity of the ischium in a serpentine manner and distributing some fibres in the groin. The study of all these nerves are rendered much more complicated by the great number of different names given to them by the various anatomists who have described them, - each seeming to have been dissatisfied with the one before him, We then took a very cursory look at the third and last branch of this nerve, the internal pudic, which we found following the road of the artery to be distributed to the muscles of the perineum, bulb of the urethra and dorsum of the penis. We have now, commencing where we left off yesterday to consider the terminal branch of this sacral plexus the great sciatic nerve, whose function it is to supply what yet remains of the limb after the distribution already considered. This nerve we find emerging upon the back of the pelvis, through the great sacro sciatic foramen

and taking its course thence down the inner back part of the thigh. When the foot is placed in the middle line, neither turned to one side or the other, and the limb extended This nerve occupies a position very near midway between the trochanter major and the tuberosity of the ischium in its progress through the fossa between these bones. It passes over the quadratus femoris and gemelli muscles by which it is separated from the bone, and is covered externally by the gluteus maximus and integuments. The exact position of this great terminal trunk of the sacral plexus is somewhat important to be remembered under certain circumstances. In those sciatic neuralgias which so frequently occur and demand remedy at your hands, it has been found useful by some to employ accupunctuation. In the first place these affections are known or believed to be produced by an inflammation of the neurilema or sheath of this nerve, which giving rise to swelling and effusion within has compressed the nerves and produced the affection. This fascia or sheath around the nerve is not like that surrounding the vessels, but beside enclosing the nerve as a whole surrounds all the various fasciculi which go off from it being continued down to the most minute ramifications, and even when lost to the eye, they surround the terminal fasciculi as seen by the microscope. Indeed the whole nerve being composed as we know, of fasciculi infinitely small, these appear all to be surrounded by ~~tubes~~ cellular tissue forming tubes as it were in which the nervous matter is lodged. These however are exceedingly small and of course not demonstrable. But the great sheath becoming inflammed it is proposed to excite it by means of accupunctuation, and this is generally advised to be done without wounding the nerve itself, which of course implies an exact knowledge of its situation. This however I do not deem to be so necessary as was supposed, for I have passed a needle purposely through the nerve to the bone without experiencing any bad results, but on the contrary much benefit, a warm glow being almost immediately experienced down the limb. This nerve pursues a straight course down the limb, in this differing very much from those of the arm, - the analogy being destroyed by ~~them~~ the great

difference between the knee and elbow joints, the one being a more perfect ginglymus or hinge joint than the other. As it proceeds down the limb it sends branches to all the various muscles in its vicinity – two to the biceps and one to each of the others. At variable heights in this part of its course the nerve splits into two main branches. In the Case this division takes place as high up as the quadratus muscle, and in some even within the pelvis. The most common point however is the upper angle of the lozenge shaped popliteal space, as seen upon the limb of the other subject upon the table, where by tearing the cellular tissue it might be divided still higher. These two branches are called peroneal and popliteal, the first of which is external to, and much smaller than the latter, each having a distinct and different destination. In following down the popliteus we suddenly loose sight of it at the lower angle of the popliteal space, where it dips down into the muscles of the leg. In this course from the superior to the inferior angle of the space we see the nerve is perfectly straight, and quite superficial standing out tense when the leg is extended. The peroneal, which we shall first take up for consideration, runs on the outer part of the leg, over the head of the fibula to get under the origin of the peroneus longus muscle, the fibres of which it sometimes pierces. As the two great nerves cross the knee joint they send off ~~two~~ each a branch which runs inward, the one being called the communicans poplitei, the other, the communicans peronei nerves. These usually join in the middle line and anastomose so as to form one nerve which runs down the back part of the leg with the external ~~jugular~~ saphenus vein and is called the external saphenus nerve. This goes down to supply the outer part of the foot, one branch reaching the little toe, anastomosing as we shall see with the anterior tibial nerve. At times however, as in one of the subjects before us these two do not unite to form one nerve, but are continued down with the vein as two branches. We now come to consider the peroneal nerve which we have seen piercing the head of the peroneus longus muscle, after which it becomes very superficial, lying just beneath

the skin and therefore liable to be wounded from slight causes, A case of this kind has fallen under my notice of a man engaged in shearing sheep, having the sharp shears in his hand, they were kicked by the animal, and the point brought over this spot so as to divide entirely this nerve, which being as before observed very tensely stretched, immediately retracted and left a considerable space between the ends. Instead of maintaining the limb in a flexed position in such ~~a~~ manner that the ends should be brought as near as possible together it was allowed to heal without any precautions having been taken, The event was a total paralysis of the outside of the foot, with some of the flexor muscles so that he could not walk without dragging his toe along the ground, He has since, however, entirely recovered the use of his leg, showing what a power there must have been to bring the ends near enough to establish a nervous action between them by the cicatrix, This tension of the nerves in the extended position of the limb, shows us how it is that any swelling about the knee joint will incapacitate an individual from extending the limb, by the opposition of this nervous cord stretched across. This peroneal nerve in the leg is the analogue of the radial in the arm, and has a somewhat analogous distribution, as it proceeds towards the ankle joint we find it dividing into two branches, one the musculo cutaneous, and the other the anterior tibial nerve The anterior tibial runs through the common extensor muscle of the toes and getting between it and the tibialis anticus, gains the interosseous ligament, where in company with the anterior tibial artery it proceeds down to the ankle joint, lying in this course upon the outer side of the vessel for the greater part of the distance, When it reaches the ankle joint we find upon it a singular enlargement of size to which I wish particularly to call your attention, as it is not sufficiently attended to ~~by~~ anatomists generally in their works and as I desire to make my instruction as practicable as possible in its nature, Along the whole length of its course down the leg it continues to send off branches to the muscles along its course, notwithstanding which it is

at least three times the size at the ankle joint which had when it first came upon the anterior part of the leg. This enlargement I believe to be truly ganglionic in its nature, as it is found in all the joints which are at a distance from the nervous centres, and is placed here for the purpose of adding to the nervous influence which is required about these points, The joints, as the knee and hip, which are nearer to the centres may have some fibres supplied to them from the ganglionic system, either directly or by their being interwoven in the coats of the arteries, which from the distance could not reach those about which this enlargement is exhibited. From this enlargement is given off a great shower of branches, not only to the parts composing the joint, but also to the short extensor of the toes, and a branch also to the large toe and the adjoining side of the toe next to it, We come next to the other branch of the peroneal nerve, called the musculo cutaneous, This runs down the peroneus longus muscle for a short distance between it and the common extensor of the toes, sending branches to these and other muscles and hence that part of its name, - the cutaneous distribution being below, Just above the ankle joint this nerve pierces the fascia of the leg getting upon the integuments to which it is distributed throughout. This branch is is often called the peroneo cutaneous is seen in its various ramifications upon the superficial tissues, upon the other subject where it is carefully dissected out, There are sometimes two branches here instead of one, piercing the fascia at different heights, in which case however the ultimate distribution is the same, namely over the external ankle joint and toes. where it forms an anastomoses with the external saphenus, The branches of the anterior tibial anastomosing with the internal saphenus, making all together a plexus extended over the whole dorsum of the foot from which the toes are very richly supplied with nerves in the same manner which we noticed upon the back of the hand, This finishes the distribution of the peroneal, and we now come to the consideration of the larger branch of the great

sciatic, the popliteal. This dips down at the lower angle of the popliteal space, under the fibrous origin of the soleus muscle where it with the artery which it accompanies acquires the name of ~~anterior~~ posterior tibial. Before this however, it gives off a number of branches to the knee joint. These generally follow the course of the arteries which we have noticed as supplying this joint, but are not so numerous as those. Although there is here some gangliونic enlargement it is not to so marked a degree as in the case of the anterior tibial, there being as before remarked probably some ramific-ations of the great sympathetic reaching as far as to this point, and thus averting the necessity of any ganglionic swelling. After sending off a great number of muscular branches to the leg on its way down, it arrives at the sinuosity of the os calcis behind the internal malleolus, in company with the artery where in winding through the fossa between the tend-ons of the long flexor of the great toe and the common flexor of the toes it divides into two branches an inter-nal and external plantar nerve. Although the division is here with the artery and receiving the same names yet the proportionate sizes of the two branches are not the same, for whilst the internal plantar artery is much the smaller of the two, the internal plantar nerve is much the largest of the two. This internal nerve is distributed to the muscles upon the sole and to the three inner toes and the inner side of the fourth one. The branch supplying the great toe has upon it a ganglionic enlargement similar to those before not-iced. The external plantar gives off near its origin the large branch to the mass or cushion of fatty ma-tter upon the os calcis. This is a very large branch and ramifies minutely in this cellular tissue, which being so dense, and so richly supplied with nerves is the reason why suppurations or contusions as stone bruises are so painfull when they occur at this po-int. Some of the fibres of this branch appear to go down to the bone, and thereby give to it a nervous supply. As the external plantar proceeds across the sole of the foot it gives of a number of bran

-ches to the deep seated muscles as the massa carnea and others, and after reaching the external side it sends a branch supplying both sides of the little toe and the outer side of the adjoining one. The branches to the other toes I need not occupy time in tracing out, as the arrangement is so similar to that of the fingers as to render any description of them entirely superfluous. We have thus finished the consideration of the nerves of the lower extremity, and seen that the parts are supplied as before said by the lumbar and sacral plexuses, - and we have seen which portion of the extremity is supplied by the different nerves from these plexuses, and thus finished the study of this part of our subject. For the few minutes which still remain to me I may call your attention in a more collective manner to the veins of the inferior extremity, having noticed them cursorily as we proceeded with the vessels and nerves there does not remain much yet to be said with regard to them. These veins are divided here as in other parts of the body into superficial and deep seated, - the latter being associated with the arteries require little attention, whilst of the former it is necessary to know something from the various affections which implicate them. The largest and most important of these, the saphena magna interna in which we sometimes bleed is formed upon the foot by a collection of veins from the dorsum and sole on the internal part, passes up over the internal malleolus and on up the internal part of the leg receiving many branches particularly from the fore part of the leg. It proceeds upwards over the insertion of the sartorius around the inner condyle until it gets upon the thigh where after many accessions, and becoming increased to a very considerable size it empties itself into the great femoral just below Poupart's ligament through an opening in the fascia lata which we have heretofore considered. The external saphenous is much smaller than the one just considered, as well as shorter. It arises from the external side of the foot and passes upwards, not over the malleolus as the other did, but upon the middle back part of the

leg where after receiving a number of smaller branches it proceeds up between the heads of the gastrocnemius externus muscle, or rather in the sulcus formed by the junction of these two heads until it reaches the lower angle of the popliteal space through which it dips down to empty into the great popliteal vein.
These form the principal superficial veins with which we are concerned, and those which are deeper seated, as they accompany the arteries need not be particularly described. The arteries of a smaller size are generally accompanied by two veins, whilst those which are larger have but one. The femoral and popliteal artery has its single corresponding vein whilst to the formation of this we have two fibular, two posterior and two anterior tibials as well as the external saphenous. When a ~~vessel~~ artery has two veins accompanying it they generally lie one upon either side, and communicate very frequently by means of small short branches running across behind the artery, like so many little veil roads of communication between the two. By this arrangement, any obstruction of one is prevented from being prejudicial, by the direction of the flow of blood into the other, which immediately takes place. It has been asserted by some anatomists that the superficial veins have more valves in them than those which are more deeply seated, which however is not true, as may at any time be demonstrated. You notice here in the femoral vein when I attempt to force a knife handle down, it is at once arrested by a valve, which is clearly shown when the vessel is laid open, there generally being two at one point and all the way down these swellings or knots indicate the seats of these valves. I do not mean to be understood that all deep seated veins have valves, for the vena cava and vessels of the lungs are without them entirely, but generally there is no distinction to be made between superficial and deep seated in this respect. You here have an excellent exhibition of some deep seated veins in a venous condition which show plainly the numerous valves with which they are furnished.

Lect. LVI.

Having finished the consideration of the general muscular system and its relations, we now proceed to examine some of the particular structures of the body, and first, we shall begin to day gentlemen, with some enquiries into the part commonly known as the throat. This as you are probably aware is not a term applied to a particular structure, but belongs to the whole of the front portion of the neck, being composed of the pharynx, larynx, œsophagus and trachea, - the mouth and nostrils being the two principal openings into it. In this head which has been separated from the vertebral column whilst the soft parts in front are remaining, we see that that column is readily separable from the pharynx which lies immediately in front of it, - and may be defined to be the passage from the mouth into the œsophagus, and from its shape and constituents may be looked upon as a muscular funnel. This funnel is however imperfect in its anterior wall from the opening into the larynx which exists there. This pharynx which we shall first take up for study, is separated from the vertebra which lie behind it by several parts the most important of which in a practical point of view is the loose layer of cellular tissue called the pharyngeal fascia. This is necessarily loose to admit of the motion which is exerted upon the pharynx in the function of deglutition, and in consequence of this looseness, the pus in diseases of the atlas or axis vertebra, resulting in caries and the formation of abscess, - finding this the most yielding of the surrounding tissues, makes its way down between the pharynx and vertebra and points in the neck above the clavicle. This I have seen repeatedly occur in practice, and gives rise to considerable difficulty in the treatment of the affection. Behind this cellular fascia we find covering the vertebra, the longus colli muscle upon either side. This we have studied at a previous meeting and now only notice it as separating the pharynx from the vertebra. Upon these then lies the back part of this muscular bag, being in this extent, entire or unbroken by any opening. The anterior portion however is not so perfect there being in it many irregularities and perforations. A general view of this will be better had from the

large model, upon which all the parts have been care-fully represented in such manner as to admit of being removed in sections. In the first position you see the larynx perfect, and upon removing the posterior half the internal structure of the anterior and lateral portions is brought to view. In this anterior semicircumference we observe several openings into the pharynx. First one from each nostril, - then the mouth, and larynx and beside these, two which communicate with the ears. These openings of the eustachian tube are however not seen in this division of the model, being hidden by the jutting points which surround them. The pharynx proper extends down as low as the fifth cervical vert-ebra, where it terminates in the oesophagus or gullet by which the passage from the mouth on into the stomach is completed, - this being a mere flexible tube for the remainder of the way. The funnel shape of the pharynx is complete below the opening for the larynx or passage to the lungs, - this being the last opening into it. Having thus a general view of the situation and extent of this pharynx, we proceed to an examination of its muscular envelope. A correct idea of the structure and function of this portion of the economy is very necessary in a practical point of view as many diseases affect it which fall under the notice of the practitioner. The comprehension of this intricate point in anatomy is therefore of importance, and should receive a full share of attention. The function of the pharynx is to receive and pass down the food and drinks to the stomach or in other words to accomplish deglutition. For this purpose it was necessary that it should be con-tractile in its nature, - each part contracting independently of the other and in a particular order. This necessary con-striction is accomplished by means of three muscles wh-ich from their offices are called Constrictors, and sever-ally according to their situation, superior middle and inferior. On account of the larynx being attached to the anterior portion of the pharynx, and forming a part of its anterior walls, these muscles could not com-pletely encompass the tube, and were necessarily attached upon each side to the sides of the larynx, which must

therefore be the point from which they act. In con-sidering these three muscles we commence with the most superficial and largest one, namely the inferior constrictor of the pharynx. These muscles exist like the generality of those already noticed, in pairs, one upon either side, and this one has its origin from the sides of some of the upper rings of the trachea, from the sides of the cricoid and thyroid cartilages and also from a ligament called the crico thyroid ligament which is extended between these two cartilages. From this origin of about two inches in length, the middle fibres run out in a nearly horizontal direction, ~~and~~ the upper ones ascend to be inserted into the median line upon the back of the pharynx, or rather into each other, these which ascend forming a point reaching to within a short distance of the top. From this horizontal and oblique direction of the fibres, their action in contracting will of course be to draw the pharynx upwards as well as to constrict the passage, and in this way facilitate the passage of the morsels down through the opening into the stomach. We then dissect up this inferior muscle and lay it to one side, when we have brought into view the middle constrictor muscle. This has its origin from the appendix and greater cornua of the os hyoides and also from the stylo hyoid ligament which we have noticed heretofore which appears to be placed here for the purpose of giving origin to the fibres of this muscle. From this origin the upper fibres ascend, the middle run horizontally and the lower ones descend to be inserted into each other upon the middle line of the pharynx. The upper fibres from the two sides meeting in a point above, are inserted by this point upon the basilar or cuneiform process of the occipital bone at a point about half an inch anterior to the ~~margin~~ of the ~~condyloid~~ Basilar foramen. The space between the foramen and this insertion being occupied by the insertion of the recti and oblique muscles which we have noticed as being seated here for the purpose of commanding the motions of the head. This insertion of the middle constrictor onto this bony point gives it the facility of acting from a fixed position, and hence it draws up the pharynx and also constricts it to a great advantage from this position.

You will observe Gentlemen that the muscular fibres of these muscles have not that florid redness which characterises the muscles upon the other portions of the body which we have considered, - neither are these fibres quite pale and white looking, - but we here witness a point of that transition from the florid red muscles of animal life, to the pale and almost colourless ones of organic existence, This change in the character is in perfect accordance with the function, as we leave the voluntary muscles above, and gradually proceed downwards until we come to those of the stomach and intestine which are entirely beyond the controll of our wills, from being concerned in a function necessary to organic existence, When we take up this middle constrictor at its origin, - dissect it off and lay it to one side, we come next to a small muscle which we have before studied in connection with the muscles of the neck, You will remember that of the three muscles which we noticed coming from the styloid process of the temporal bone, one was the stylo pharyngeus which ran to be inserted into the edges of these muscles and into the sides of the thyroid cartilage, - having for its office, that of drawing the pharynx up, so as to receive the bolus which was to be passed down, This as you will now observe lies between the middle and ~~upper~~ lower constrictors of the pharynx, and is situated very well in order to raise up the pharynx and also the larynx, which are however inseparable and must move together, When we cut this muscle across and dissect up its points we have brought into view the third and last muscle, the superior constrictor, This arises from a ridge upon the upper and lower jaws behind the molar teeth and from a white ligamentous band which connects these two points called the pterygo maxillary ligament, also from the pterygoid process of the sphenoid bone, from all which space the fibres cross to be inserted into the cuniform process of the occipital bone and into each other upon the middle line of the pharynx. By the stretching across of these fibres to reach the cuniform process about half an inch in ~~advance~~ behind of the foramen magnum, there is a small space left above

the muscle. This however is not a weak point as it is closed up by a very dense process of fascia, rendering it equable in strength to any other part of the structure. The situation and direction of these muscles with their relations, are better exhibited by this large colored drawing where they are all represented. This superior muscle is here seen to be not so large or broad as the inferior, and to occupy less space, but its action is not therefore less important or less extensive. It is interesting here to notice the connexion between this muscle and and the buccinator which we found upon the cheek on another occasion. It will be noticed that this buccinator arises from the two maxillary bones and from the pterygo maxillary ligament just opposite to this muscle, and is therefore the proper antagonist to it in this respect being in fact a kind of extension of this muscle forward upon the cheeks, in order to give a facility of action in deglutition. Thus this muscle is by this means enabled to clasp the food as it were, and carry it back to the top of the pharynx with the aid of the tongue, when the fibres of these constrictors were successively called into action upon it so as to compress it down into the oesophagus, very much as though you made a cylindrical passage of your two hands, and then commencing at the top contracted one finger at a time all the way down to the end. By these successive contractions any substance would of course be forced down through the tube. These three muscles are all associated together by the nerves which govern the act of deglutition so that they always act with the proper order, and to the proper extent. We now proceed to lay open the pharynx, by a vertical section through the posterior median line. In this we find that we have beneath the muscles which we have considered, a strong and resisting sheet or layer of condensed cellular tissue, and beneath this or upon the inner surface of the tube the thin and almost transparent mucous membrane of the part. Thus we see that it has three distinct different coats the middle being a resisting fibrous fascia, making

up the ordinary muscular, cellular and mucous coats. In thus opening the pharynx from top to bottom, we bring into view the entire front portion with the openings which we have before noticed upon it, the most conspicuous of which is that into the larynx. We notice here that the mucous lining of the pharynx when it gets to the upper part, where it is inserted upon the cuneiform process of the occipital bone, is reflected forward over this bone so as to line its inferior face. This bone then, so lined forms the roof to the pharynx for a distance of one inch anterior to the insertion of the muscles, - there being nothing interposed between. It is from this portion of the bone that in inflammation and caries of it the mucous membrane is ruptured and the carious portions drop into the throat, a circumstance which I have several times witnessed in practice. From this point of this bone we pass forward into the nostrils, - the cavities of which we find separated from the mouth by a moveable partition at the back part. This septum is called the velum pendulum palati, and is placed horizontally across the top of the pharynx, or continued back from the bony floor of the nostrils and roof of the mouth. It acts here the part of a perfect valve to the passages which it lies between. The lengthened point which you notice extended back and hanging free in the cavity is the uvula. This velum pendulum is furnished with a number of muscles by which it is enabled to fulfil its offices. These are to close the passages into the nostrils whilst food or drink is passing down the throat, and then to open these passages for the passage of air in respiration. It also aids in the act of deglutition by pressing the substance to be swallowed, down into the pharynx, in order that it may be grasped by the constrictor muscles. We next come to a consideration of the Larynx, or passage from the pharynx into the trachea, - by which the air is carried in respiration, and in which the phenomena of voice is produced. It lies anterior to the lower part of the pharynx out of which it opens. - and the tube is carried on down under the name of trachea, after we arrive at that cylindrical portion which is formed by

regular rings. This is a very important structure and one of the most beautiful pieces of mechanism which it is possible to meet with, and although somewhat intricate in its anatomy, may yet be clearly understood by a moderate degree of attention and study. The first part to which our attention must be given, is to the Cartilaginous and bony structures which compose the larynx. It consists of various parts, namely five Cartilages, muscles, nerves, ligaments and a mucous lining. The cartilages of course form the basis of this structure. They form an enlargement upon the tubular trachea below, like a capital upon a column. The inferior Cartilage is connected to the rings of the trachea, being in itself an irregular ring. This is called the Cricoid Cartilage, and forms a ring which is much ~~[illegible]~~ deeper vertically, behind than before, being as it were, bevelled down in front to quite a narrow space; This bevelling takes place upon its upper edge, the lower being fixed upon the upper ring of the trachea. Upon each side of this Cricoid Cartilage there is a small but complete glenoid cavity, into which are received the processes of the thyroid Cartilage above, forming thus a perfect and movable joint between them. Along the upper margin is inserted a ligamentous expansion which is spread across a space between these two cartilages, This is called the Crico thyroid ligament, and enables the thyroid Cartilage to be bent on the Cricoid, in the motions of the head, without any inconvenience, - and hence the necessity of this yielding material. The next above this on the anterior portion of the larynx is the thyroid, the largest and most prominent of all the structures of the larynx. This, in the child is formed of two separate pieces one on each side, called the lateral Alæ, but in the adult they are joined together upon the anterior median ~~middle~~ line of the larynx, and form a single Cartilage. They have been called Thyroid from a supposed resemblance to the ancient shield. They are bounded above by a rounded border with the convexity upward, which terminates posteriorly in a lengthened process called the greater Cornua. This posterior ~~upper~~ border has much the shape of the italic letter S, below the edge is terminated

by a shorter process called the lesser cornu, - by which it is articulated with the cricoid cartilage by the glen-oid cavities before noticed. Where the two cartilages are united in front there is a deep notch extending down between them forming one of the extremities of ~~the~~ an upper S. -
The specimens which I here exhibit to you are bony in which condition they are generally found in advanced age, - the period of ossification being about the fiftieth year when the cartilages of the ribs and other parts of the body are so liable to take on this change.
On the upper posterior part of the cricoid cartilage are situated two of smaller size, called from their resembl-ance when joined together, to the mouth of a pitcher, -arytenoid cartilages. The articulation of these small bodies is by a perfect joint, upon the cricoid cartil-age, each being furnished with a capsular ligament and synovial membrane. In the natural state they are not separated as is represented upon this specimen, but are united by ligaments and mus-cles which we shall hereafter have occasion to notice -being thus very movable. The fifth and last of these cartilages is the uppermost and from its situation above the glottis is called the epiglottis. This which is repre-sented on the model on a large scale, is as you see of the shape of a myrtle leaf, being attached by its footstalk or pedicle to the thyroid cartilage just within the notch before noticed in its anterior part. Its position is obliquely backward from its attach-ment, and it forms the valve by which the glottis is closed, in some measure being forced down by the food so as to rest
The closing mainly being made by lifting the larynx
upon the arytenoid cartilages. This is a very flexible substance and answers the purpose of preventing any substance swallowed from "going the wrong way" as it is expressed. When the covering of this cartilage becomes inflamed and swollen, it is very apt to admit of the passage into the larynx of small particles of food or drink which give rise to violent fits of coughing and strangulation, which is very annoying and painful. We have now taken a cursory view of the structure of the larynx and when we meet again must direct our attention to its other constituents.

Lect LVII.

At the conclusion of yesterdays lecture gentlemen, we were engaged in the consideration of the Larynx, and had gone over the Skeleton of this somewhat complicated structure. We found this frame work to consist of first the Cricoid cartilage which was in immediate connexion with the trachea being of an irregular shape, - wider behind than before, - Next we noticed the larger thyroid cartilage, which we found composing the greater anterior part of the larynx and connected by the articulation of its lower cornua, with the cricoid, - We then noticed the two smaller cartilages articulated by complete joints with the posterior or wider part of the cricoid, and connected by ligaments with each other, - called the arytenoid, - and lastly, making the cartilaginous structure complete, we examined the epiglottis, or myrtle leaf shaped cartilage, which we found attached in front to the thyroid and standing erect like a valve over the opening into the larynx, The thyroid cartilage, which as before noticed forms the prominent part of the larynx, - becomes developed to a greater extent than at any prior period, - about the age of puberty, and forms that protuberance in the throat known as the pomum adami, or adams apple, - giving rise at this time to that alteration of the voice which characterizes to period of adolescence, Although this excess of development takes place in both sexes, yet as you know from casual observation, it is much more marked in man, whose voice then takes that character which distinctly designated as manly, from the heretofore boyish tone,

We noticed yesterday also that the joints by which the various cartilages articulated with each other were in every respect calculated for free motions, - being furnished with capsular ligaments and synovial bursa, - and also that there was a space in front between the upper edge of the cricoid and the lower edge of the thyroid, not filled up in the skeleton, but which in the natural condition had stretched across it a ligamentous membrane called the crico thyroid ligament. This membrane in the natural condition is traversed in a transverse direction as you see by a branch from the superior thyroid artery, sometimes called the recurrent thyroid, The branches of this artery pierce the membrane

and get through into the inside where they are distrib-
-uted upon the membrane lining this portion of the la-
-rynx, We have now to notice that between the thyroid
cartilage and the os hyoides or tongue bone above it, there
are three points of connexion by as many ligaments,-
first the greater cornua of the cartilage are attached to the
greater cornua of the bone by a ligamentous band upon
each side called the lateral thyro hyoid ligaments
and another much broader and stronger band in the
middle which being more of a membranous character is
called the middle thyro hyoid membrane, This is
a dense and strong structure and is somewhat pecu-
-liar from being composed of several layers which are
connected by cellular tissue and are movable upon
each other, Between two of these lamina is very often
found a small bursa containing synovial fluid, for
the purpose of diminishing friction here, This it is
well worth while to remember, as it sometimes becomes
enlarged making a projection into the neck, Whenever
you have a small fluctuating tumour at this point, the
motions of which follow those of the larynx, you may
suppose it to be a cyst formed of this bursa for which
there is no remedy except dissecting out perfectly and
clearly, for tap it as much as you will it will still
return until eradicated, Unless you are aware of this
liability to become distended, you might be embarrassed
to account for such an occurrence, A lady from Chester
County has lately come under my care in which a
tumour the size of a hickory nut existed at this point
which was at once recognized and removed without
difficulty, These peculiar enlargements were first poin-
-ted out by Dr Physic, who found no other means of
remedying them than the one laid down, We have
next to consider the os hyoides so called from its resem-
-blance to the Greek letter υ, This is the proper tongue bone
and consists of a body and four processes, two greater
and two lesser cornua the latter projecting upwards and
the former connected to the greater cornua of the thyroid
cartilages, These processes do not become united to the
body by ossific deposits until a somewhat advanced
period, being only connected by a ligamentous union

this, with the number of muscles which are connected to both portions, gives them a predisposition to displacement which sometimes occurs under irregularities of action in these muscles, forming a kind of semi luxation. This accident, which I have several times seen, is characterized by great pain and swelling, with a tumour, something like a luxation of the jaw, - taking place from a gape or yawn. There is no treatment which I know to be any beneficial, - the antagonist muscles having drawn it back to its place without any inconvenience resulting. Upon the body of this bone we notice a great many elevations and depressions, at different points for the insertion of those muscles which we have seen coming up from the sternum, and others down from the tongue - and others again from the direction of the shoulder, - upon the posterior portion there is a hollow or excavation of some size, which in man is but rudimental, and not possessed of any appreciable utility. In some animals however, as the howling monkey of Java, and in the jack ass, as well as all other animals which bray with a loud voice, - it is very strongly developed, - and appears to be involved in the production of their peculiar loud and strong tones. This is the bone of the tongue, - that organ having no other bony connexion whatever, and its attachment to this, and the union of this with the larynx, is the reason why in protruding the tongue from the mouth the larynx is drawn up. The arytenoid cartilages we have seen are articulated firmly to the cricoid cartilage at their base where they are close together, but their upper extremities are only confined by two ligaments upon each side, one attached near to the point, the other below. These are the thyro arytenoid ligaments being attached by the other ends to the thyroid cartilage on each side of the angle formed by the union of the two alæ. These ligaments are covered by folds of the mucous membrane which are reflected off from the sides of the larynx over them, and the lowermost two, form the proper vocal cords or ligaments. When the larynx is split open these cords are not brought into complete vision, as the

membrane which covers them thus draws them in to the side of the larynx, These two cords or ligaments on each side being covered by the lining membrane, must necessarily have a space between which is inclosed as it were by them, - this is the ventricle of Galen or Morgagni, - or the ventricle of the larynx, and from it we have a kind of pouch called the sacculus laryngis. This is merely an arrangement by which the surface of mucous membrane might be enlarged to give space for a greater number of those small follicles which secrete the mucus by which the parts are lubricated and kept in a condition best addapted to the functions of the part. - We find the whole of the surrounding membrane completely studded with these little mucous follicles the moist secretion from which is here so necessary. This ventricle has probably some agency in the production or modification of the voice. The surface of the membrane covering the epiglottis we notice is completely covered by little arteries which are here injected in great numbers although the injecting matter was coarse, - being also studded throughout with little glands or follicles which throw out a secretion to keep the parts free and moist, The inflammation which attacks this very vascular structure gives rise to that affection known as the clergymans sore throat, We find the epiglottis fastened to the base of the tongue here by folds of the mucous membrane being reflected of at three different points these are called the frena and the outer are called the lateral and the other the middle frenum of the epiglottis, Between these folds on either side of the middle one there exists a small pouch, into which particles of food sometimes fall, and give rise to fits of coughing and strangulation, from the irritation which is transmitted into the larynx, Within this mucous lining the epiglottis is composed ~~of~~ in part of that peculiar kind of elastic tissue, which admits of being easily bent but immediately returns to its previous position after the force has been removed, - like a piece of gum elastic, - from each side of this epiglottis to the ends of the arytenoid cartilages are extended folds of this

lining membrane forming the edges of the opening into the larynx, which is called the Glottis, these folds being called the arytino-epiglottideus ligaments, These with the frena serve as stays to hold the epiglottis erect in which position it always remains except when pressed down by the passage of the food over it, not being at all subject to muscular influence but returning to its upright position entirely by the elastic power of its tissues, We will now make a section by which to expose the vocal cords more completely, as they exist naturally, by cutting away the parts above and below, - showing what constit-utes the rima glottis, As you now look through the opening, the obstructions having been removed, you notice between the two vocal cords before mentioned a narrow angular opening or chink, which being widened by the forceps, again returns to its natural condition, This is the proper rima glottidis, between which and the Glottis simply, it is necessary to make a distinction as they are applied to different open-ings, - the latter meaning that which communicates with the pharynx and which is closed by the epiglottis, The passage of the air through this rima glottidis, by which the cords are thrown into vibration, is the mode in which the primitive tone of the voice is produced, being modified by the ventricle and upper cords, - Thus we see that the larynx in the production of voice partakes of the character of both wind and string instrument We now have to enquire into the muscular structures which surround these structures, or in other words the intrinsic muscles of the larynx. These are all very caref-ully dissected out upon this preparation, but may be demonstrated more clearly upon the large model where they are all represented in a magnified condition, These muscles are seven or eight in number and alth-ough small are capable of exercising active motions, The first to be noticed is the Crico thyroid, This arises from the side and front of the ~~thyroid~~ cricoid cartilage and is divided thence into two portions which run ob-liquely backwards to be inserted into the lesser cornu and lower part of the thyroid cartilage. Posteriorly

we have first ~~the~~ lateral Crico Arytenoid, which arises from the ~~side~~ of the cricoid cartilage where it is partly covered by the edge of the thyroid and is inserted into the base of the Arytenoid Cartilage laterally, - the next is the posterior Crico arytenoid muscle, This arises from the posterior part of the cricoid cartilage and is inserted into the base of the Arytenoid Cartilage posteriorly, - Again there is the ~~Thyro~~ Arytenoidei ~~antici~~ which arises from the middle of the base of the thyroid cartilage upon its inner face, and running backward and upward is inserted into the middle of the Arytenoid Cartilage We have then transverse Arytenoid. This arises from the outer border of one cartilage nearly its whole length and inserted upon a corresponding part of the other, The next is the Oblique Arytenoid, arising from the base of one cartilage crossing its fellow is inserted into the apex of the opposite one, - And then the thyro-epiglottideus, arising from the thyroid cartilage internally and inserted into the side of the epiglottis, consisting of only a few pale fibres. And lastly the Aryteno epiglottideus which arises from the upper part of the arytenoid cartilage and running along in the fold which forms the edge of the glottis, is inserted into the side of the epiglottis, There are sometimes two of these muscles a superior and an inferior, but they are always very small and pale, This completes the seven or eight muscles of the larynx, all of which have their action upon the vocal cords either in lengthening shortening closing or separating them, and by this means modifying the voice, In a case which I had an opportunity of observing at the Hospital, in which an individual after endeavoring to cut his throat, - had a serious opening left into the larynx, - the motions of these parts were seen, and the astonishing rapidity with which they moved in the ordinary production of voice, can scarcely be conceived without being seen, There are other influences which act in modifying the voice and these are the changing mouth and nose, but into the physiology of the production and variation of voice I shall not enter as that is the province of my friend the professor of institutes, The next

must enquire briefly into the structure of the velum pendulum palati, and the parts immediately surrounding it. When the lower jaw is divided and we look in over the tongue we see this form a movable partition hanging down into the top of the pharynx separating the back part of the mouth from the no-se - and when viewed from the back part, the same thing is witnessed. Now just at this portion of the throat there are two depressions, - one upon each side which I find that students have a difficulty in forming a proper idea of. From the uvula which we see is the centre point of this velum pendulum - there runs a fold of mucous lining in the form of a segment of a circle down to the side of the tongue nearly transversely. From the same point there is also another fold running more obliquely backwards and downwards to be lost upon the sides of the pharynx. These are what have been called the two lateral half arches of the palate, and between them there must of course be a depression, in which lies this small body, which is the tonsil gland. Now the space between the two anterior half arches is the isthmus of the fauces, these anterior folds being the anterior boundary of the fauces, and in the same manner the posterior folds are the posterior boundaries, thus the fauces consist in the space between these folds, being a somewhat angular shaped cavity, in which is lodged only the tonsil glands. Now within these folds and connected with this velum pendulum palati are lodged some little muscles which it is necessary to direct our attention to. The first of these is a small one with pale fibres called the Constrictor isthmi faucium. This arises from the middle of the ~~mottel~~ velum pendulum palati at the base of the uvula, and runs outward in the fold forming the anterior half arch, to be inserted into the ~~[illegible]~~ side of the tongue, its office being as its name imports to constrict or bring together the isthmus of the fauces and make the passage narrower. In the posterior view of these parts there are several small muscles which we must next notice,

In the uvula we find some muscular fibres which have usually been described as one muscle, but which ~~are~~ now appear to be really two together, - this is usually called the azygos uvula, ~~this~~ and arises in the mucous membrane chiefly at one end of the uvula and is inserted in the same manner into the other, The office of these muscles appears to be that of keeping the uvula of a proper length, but it frequently becomes swollen and infiltrated in such a manner as to be two or three times its usual length, The next muscle is the levator palati which arises from the petrous portion of the temporal bone near where the eustachian tube pierces it and is inserted into the velum pendulum palati for its whole length, meeting its fellow of the opposite side, Another is the palato pharyngeus This muscle arises from the middle of the velum at the base of the uvula and running backward and downward in the posterior fold of the lining forming the posterior half arch, is lost upon the sides of the pharynx. This muscle depresses the velum or raises the pharynx, - and bounds the tonsil gland posteriorly, - Again we have the Circumflexus or Tensor Palati. This muscle arises from the spinous process of the sphenoid bone and from the eustachian tube as it passes into the temporal bone, and from the base of the pterygoid process of the sphenoid bone, - from these points it runs along the pterygoid plate of the sphenoid and turns around the hamulus, upon that plate and thence proceeds ~~at~~ a course nearly at right angles with the first portion, to be inserted into the whole of the velum pendulum palati, having for its office to make this velum tense or stretch it from side to side, Having now cursorily treated them from the subject, I shall at the next lecture go briefly over them from an enlarged drawing which will render them more clearly understood perhaps than that upon the subject. I wish now to draw your attention for a moment to a preparation in which the lymphatics of the lower extremity have been injected with mercury from a single pipe inserted upon the foot showing clearly the routes of the vessels through the glands about the groin.

**Lect. LVIII.** I wish to day, gentlemen, by way of recapitulation, to direct your attention again to the muscular structure of the velum pendulum palati and the neighboring parts as it is a very intricate point of anatomy, and one which I find the student often gets an inaccurate or imperfect idea of. This I shall do from these enlarged drawings which are perhaps better calculated for it than the demonstration from the subject as the parts are there small. We again notice the two lateral half arches made by folds of membrane each commencing at the uvula and then separating, the one going to the side of the tongue, the other being lost down the side of the pharynx. These two folds of the mucous membrane it will be remembered, contain two muscles, the Palato pharyngeus in the posterior and the constrictor isthmi faucium in the anterior. This space between these folds we noticed as forming the fauces which was thus an angular space, the apex being at the meeting of the two folds upon the uvula, and the base being about three fourths of an inch wide, - the isthmus being the space between the two anterior folds. In this space we found a depression in which was lodged the tonsil gland. The mucous membrane lining this gland we find pierced by small apertures, and tracing these in we find them enlarging into follicular cavities around which are collected great numbers of the ordinary mucous crypts which pour their secretion into these sacks. Thus the tonsil gland is nothing more than an aglomeration of great numbers of the follicles which are everywhere found studding the mucous membrane, - packed up here in order to economise space and pour out their secretions extensively upon the surface where it is most required. These glands under ordinary circumstances of health are not visible to the eye when looking into the pharynx, being hidden by the anterior half arches. Under many circumstances however they become inflamed and effusions of lymph are poured out into the cells, so as to enlarge them to a greater or less extent, - sometimes to so great a degree that those of the opposite sides meet in the middle line. When the become thus enlarged and hardened, they require to be shaved off, otherwise the interfere with

deglutition and voice. In the enlarged condition the small arteries with which they are well supplied become enlarged to such a degree as to give rise to hem-orrhage in the removal, and this is more apt to occur when the bodies have been smoothly cut off as with a sharp scalpel, than when the cut is accompanied by some laceration. This fact which experience has taught me, induces me to give preference, in the opera-tion to those instruments which cut by an elliptical knife, - the guillotine of Physic and other chisel ins-truments cutting the parts more smoothly. These bodies sometimes called the amygdalae, are also subject to inflammations of a more acute character, which run on to produce suppuration as in ordinary Quinsy. The common mucous lining of the throat also lines the little cells into which the follicles pour their secretion so that we may readily see how any inflammation of the surrounding parts may be transferred to these glands and involve them to a greater or less extent, hence the frequency with which this variety of sore throat occurs. We now look upon the drawing to the situation of these little muscles which it is so difficult to get a correct idea of. The two which are enclosed in the folds of the half arches were so clearly marked out by them as to be well und-erstood by every one. but the one which raises up the velum, and that which stretches it from side to side are much more difficult to comprehend. As we look upon the velum from behind, where it is represented as having the lining membrane removed we see first the azygos muscle as it has been called but the meaning of the term is here entirely perverted as two muscles may be clearly demonstrated, lying side by side upon the middle line. From the side of this we see a number of white fibres running outwards and in a somewhat curved direction upwards to be attached to the petrous portion of the temporal bone and the side of the eustachian tube. This is the levator palati muscle, and has for its office, the raising up of the velum pendulum palati. The other muscle called the tensor palati has its origin

from nearly the same point, being attached to the opposite side of the eustachian tube, and the adjoining portion of the petrous portion of the temporal bone, From this point it proceeds along the internal plate of the pterygoid process of the sphenoid bone, and after passing around the hook or hamulus is inserted into the whole side of the velum pendulum, having a tendency to stretch it out and ~~taught~~ make it tense. It is the action of this muscle, which draws the edges of the wound apart in the operation of staphyloraphy, and increases the difficulty of a complete cure. - In such cases the parts should be kept at perfect rest and the muscle thereby put in action as seldom as possible. We are now prepared to pass down the parts already considered to the trachea and contents of the chest. In the examination of the larynx I mentioned the ventricle of this structure, and demonstrated it upon the subject, to aid however in the comprehension of this difficult structure, I have had a very large diagram, of the larynx divided by a vertical section from side to side, in which the course of the lining membrane is traced out, as it passes over the superior and inferior thyro arytenoid ligaments, the latter of which are as you will remember the proper vocal cords - the space between them being the rima glottidis. The extent of the glottis from the opening into the pharynx down to the rima glottis, is now fully seen, when it appears to comprise a larger portion of the larynx than might have been supposed, The pouch called the sacculus laryngis which I demonstrated to you is here shown, and presents as you may see the appearance of a large follicle or sack being merely intended for the purpose of increasing the surface for the mucous follicles which are here necessary in unusual numbers, As this lining membrane passes down the trachea it is somewhat peculiar in its arrangement, being thrown into longitudinal folds, and having the appearance of ligaments large, I have here a part of the trachea of an elephant, upon which this arrangement is very apparent, this being only a magnified or enlarged rep

-resentation of that of man. for the folds are perfectly similar although of course collosal, These folds & the membrane composing them have been considered by some to be of a muscular character, and to by them contracted into these rings, This however does not appear to be the case, but that there is some elastic tissue in the structure by which they are drawn thus into long folds, Under this, or outside of it, we have transverse muscular fibres passing a part of the way round the tube, but of them we shall have occasion to speak at another time, The length of the trachea will be obvious from the preparation which I here exhibit to you being from five to ~~six~~ 4 1/2 inches, extending from the fifth cervical vertebra, to the third dorsal where it divides into the two great bronchus to the lungs of the opposite sides, It consists generally of from fifteen to twenty rings as they are called, but which are not perfect ones from the absence of a portion of each at the back part, This trachea from being superficial at the middle of the neck gradually recedes from the surface as it progresses downwards, until at the upper edge of the sternum it lies one and a quarter inches behind it, After loosing sight of this trachea then we take up for consideration the so called Cavity of the Chest and the contents which occupy it, The great part is occupied by the three great organs as the heart and right and left lungs, beside which we have the vena cava, aorta, thoracic arch and vena azygos, We have seen in the case of the abdomen that there existed a peculiar serous membrane surrounding all the viscera contained in that cavity and indeed wherever the parts examined have been subjected to motion we have found such serous membrane by which a secretion was poured out to lubricate the parts Now from the function of the organs in respiration there is no organs so subject to motion as the lungs, and consequently we have placed here the same kind of arrangement, There is this difference, between the lungs and the abdomen, that whilst the latter was enveloped by a single serous sack, the Cavity of the chest has three, one for each lung, and one for the heart being distinct and separate sacks. These being

Kiel estimates the surface of the mucous membrane spread through the lungs at 150 square feet. (the size of a good ~~large~~ sized chamber I think W) or ten times that of the external surface of the body.

that of the abdomen are reflected over the adjoining parietes so as to give them a coating as well as the surface of the contained organs. Thus the two which surround the lungs, called the right and left pleura, are attached to the periosteum of the ribs and the intercostal muscles by cellular tissue to which as in the case of the peritoneum the smooth surface seems to be only a condensed facing as it were. The outer surface when the ribs and muscles have been removed, does not appear smooth and polished like the inner in consequence of this cellular tissue by which it is attached. This pleura passes down much lower upon the ribs than might at first be supposed, going to within about 1½ inches of the cartilaginous borders of the 9th and 10th ribs. Now in these hypochondriac regions below the ribs, we have upon both sides the lobes of the liver, lying directly below this portion of the pleura, and hence inflammations of the one are liable to be, and very frequently are mistaken for one another, Thus occupying the same point, we find these pleura also reflected over the diaphragm, giving a coating to the whole face of this partition. As soon as a child has breathed after being born some portions of the lung are expanded by the air, beyond the possibility of being again ~~collapsed~~ entirely divested of air, there always being a quantity of air remaining in the lung even after the most forced expiration, say about 100 cubic inches ~~almost or quite equal to that which is drawn in at an ordinary~~ being about ~~15~~ 16 inspiration, I have here a syringe which holds say thirty cubic inches of air ~~about~~ twice the quantity taken in at an ordinary inspiration. Now by attaching this to the trachea we can in a manner imitate the respiration, when I force it in you notice that the lung is expanded and brought out to fill the pleura, and when the piston is withdrawn it is again collapsed. This collapse will however take place from the elasticity of the tissue of the lung which as you see forces the air out and returns to the previous condition when the neck of the pipe is opened. These pleura are divided each into costal pulmonary and diaphragmatic portions according to their situations. The two layers of costal pleura line the sternum as far as the middle when they come together

and are reflected backwards, These two layers are as you see, easily separated down until they strike the pericardium where they are again reflected off over this membrane. This portion of the Chest is called the anterior mediastinum in which we find as we pass up towards the neck, a mass of cellular tissue which once in the foetus constituted the thymus gland This which is found to be large at birth is supposed to have some connexion with foetal life, is it only begins to decrease at this time, Sometimes however it still enlarges after birth and by pressing upon the bronchia gives rise to what has been termed Thymic Asthma This is very rare, yet does sometimes occur as I have seen, having also been noticed by some of the foreign writers We now shall open the costal pleura upon each side of the Chest, in one of which we find it adherent to ~~the~~ that covering the lung by means of organized lymph, This is the effect of pleurisy and from the character of the lung in which it occurs, would suppose it to be the result of the formation of tubercles which frequently does give rise to ~~tubercles~~ have adhesions, These adhesions are not very firm being as you see readily separable by means of the finger, The reflection of the pleura over the diaphragm gives occasion to the occurrence of what is therefore called diaphragmatic pleurisy, which is attended with hiccough and other nervous symptoms which attend diseases of the diaphragm. Upon the opposite side of the Chest such an occurrence has taken place the two surfaces being entirely glued together by the effusion produced by the inflammation, as we trace them down to their termination at the lower part. In such a case the seat of pain must have occupied the situation of the right lobe of the liver and might therefore have embarrassed a young practitioner in making out a diagnosis, Another fact not unworthy of notice here, is that notwithstanding the adhesions formed here the lung has performed its functions without apparent difficulty, being inflated quite as fully as the other, I shall leave the subject for your examination as the it is very interesting to observe such adhesions in reference to the study of pleurisy

**Lect. LIX.** Having shown you gentlemen, in yesterdays lecture the manner in which the pleura lined the ribs, cartilages and ~~margins~~ inner face of the sternum, we are to day prepared to trace out its reflections over the lungs, and the manner in which these reflections form the three mediastina of the Chest. We noticed yesterday that the pleura passed down very nearly to the cartilaginous border of the ribs and was then reflected off over the diaphragm. This pleura could not of course extend down entirely to the border of the ribs, in as much as the space just within, say for an inch and a half, is occupied by the origin of the diaphragm which we have before noticed in connexion with that muscle. Upon the right side of the body, the liver being much larger, projects further up, into the Cavity of the Chest, allowing a portion of the lung to descend in front of the liver as it were. Thus it will be seen that the liver and lungs here are only separated by the muscle of the diaphragm. In abscess of the liver the matter sometimes points upwards towards the diaphragm, and by its pressure here causes ulcerative absorption not only of the diaphragm but also of the surface of the lung, into which the pus is then discharged and expectorated. We yesterday traced the pleura to ~~them~~ the middle of the sternum where we found it reflected almost directly backward until the layers from either side come down upon the pericardium And this we then noticed as constituting the anterior mediastinum. After reaching the pericardium the two layers again diverged over this fibrous membrane, and were continued back until they met the roots of the lungs, being no connexion whatever between the sacks of the two sides. In the Anterior Mediastinum we find nothing of great importance, it being for the most part occupied by the remains of the Thymus gland which is now only a mass of cellular structure, and a quantity of loose cellular tissue to fill up the space and keep the two pleural sacks in their proper relation. Now we saw in noticing the position of the heart that instead of being in the middle line the apex was directed towards the left side, so that the pulsatory was felt between the ends of the fifth and sixth ribs

The pleura of the two sides being reflected down upon the heart, they must of course vary with the course of this organ to the left side. This causes the anterior mediastinum instead of lying under the middle line of the sternum to be directed a little to the left. This point it is of importance to remember as it will sometimes influence us in practice. This Cellular tissue in the mediastinum is liable to have abscess formed in it, either originally or dependent upon caries of the sternum which is not unfrequently met with. It may also receive purulent deposites from abscesses formed in the neck. In these cases the matter infiltrates the cellular tissue and is carried by gravity down to the lower part of the space where it will collect sometimes to the extent of a pint or more. It may be punctured at this point between the cartilages of the fifth and sixth ribs, without wounding the pleura of either side as the instrument will go between them. These abscesses sometimes point below the xyphoid appendix of the sternum and discharge great quantities of matter in this way. - But as a general rule they may be punctured at the point above indicated without running much risk of injury to any important organ, provided it be properly done. At the lower part of the Chest the pleura forming this mediastinum is continuous with that which lines the diaphragm, being reflected over it from each side. When these layers strike the roots of the lung they are reflected off over them to give them the smooth polished coating which you see shining upon their surface, going smoothly over the entire surface and dipping into the fissures between the lobes, and getting upon the posterior face is continued back to the root again after enclosing the lung as in a sack, upon reaching the posterior surface of the root of the lung. it is again reflected back over the bodies of the vertebra and back upon the ribs from which point we first started in our route to trace out the membrane.

Now in this reflection from the root of the lung over the sides of the vertebral column on each side must of course leave a space behind the roots of

of the lung, and between the pleura of the two sides. This space is the posterior mediastinum, which contains a number of very important parts as the aorta, vena azygos, thoracic duct, oesophagus, pneumogastric nerves &c. Now the anterior and posterior mediastina which we have thus seen are separated by the heart and roots of the lungs, as they would otherwise be continuous. The heart however does not extend up as high as the upper lobes of the lungs, and there must therefore be a portion above in which if the anterior and posterior were extended up, they would be continuous with each other. In fact this space is only a connexion between these two. This space which is called the superior mediastinum is formed between the receding layers of pleura as they pass off in the direction of the first rib, in order to cover in the apex of the lung. This reunion of course will leave a triangular space the base of which will look upwards towards the head, and vary in highth according as the apex of the lung rises higher in some cases than in others. The point to which the lung rises ordinarily, is the clavicle behind which it may generally be found, the pleura as mentioned when speaking of this muscle generally being found to line the anterior scalenus. In females, however, who have subjected the lower part of the thorax to extreme pressure by means of corsets, the lung often rises much higher from the displacing influence, sometimes making a tumour above the clavicle. This confinement of the apex of the lung within the narrowed space above has been supposed by some to be the reason why it is so generally the seat of tubercular deposits in the commencing stages of Phthisis. The parts contained in this superior mediastinum are very numerous and important. First we have the large vena innominata of the right side, or transverse vein, to which is joined the united veins of the left side to form the great superior descending cava which thence proceeds down to the right auricle of the heart. Then we have the Anterior

innominatta, which divides into the subclavian and primitive carotid, - The pneumogastric and phrenic nerves, The trachea and oesophagus, - The left sub-clavian and carotid arteries, thoracic duct and the vena azygos where it makes its arch to empty into the greater veins. As through the anterior mediastinum we saw that there went nothing of importance, and as the lungs fill all the remaining cavity of the chest, all the -se modes of communication between the upper and lower portions of the body must take place through this space The vena azygos is here very well shown, and as you see, it forms the only large anastomotic connexion between the superior and inferior vena cava. The various parts contained within the posterior mediastinum may be well seen by referring to this enlarged drawing, where the thorax is represented as having been divided transversely and the end brought to view. We have here an opp-ortunity to trace out the pleura again, and as it may aid in impressing it upon your minds, I again go over the reflections by which the whole parts are covered We now see what constitutes the posterior mediastinum and in what manner it separates the back portion of the two lungs from each other, Contained in this we have the descending aorta, - the oesophagus, - vena azygos, and vena demi azygos, - the pneumogastric nerve, and the thoracic duct. This pleura, and the formation and contents of the three mediastina being now I hope made perfectly clear, we shall examine as to what con-stitutes the root of the lung. We have first coming down from the larynx, the trachea a tube of about four to five and a half inches in length, and three qu-arters of an inch in diameter, extending between the fifth cervical, and third dorsal vertebrae, opposite to which it divides into two branches, one for each lung. These branches are however of very different lengths, the right being considerably the shortest. These Bronchia as the divisions are called go to form a part of the root of the lung, The vessels running to and from the heart, namely the pulmonary artery and veins, also go to the formation of this root, which with the bronchial arteries and veins, ~~and~~ nerves and absorbents

complete the constituents of these roots as they are called. The absorbent vessels here as you see have a chain of glands upon them before they enter the lungs, after which not one is to be found upon them. These glands are in the infant of a rose colour, like those in other parts of the body, but in the adult they are as you see of a black grey colour from the deposite of carbonaceous matter taken up from the lungs and deposited in these station houses as it were. We often find tuberculous matter also deposited here having been conveyed in the same manner from the lungs. This blackening takes place gradually as life advances and the glands become sometimes enlarged so as to press upon the bronchia and give rise to a difficulty in respiration. This however is very rarely the case and cannot be certainly recognised when it does occur un-til revealed by a post mortem examination of the parts. The lungs are usually divided differently upon the two sides, - there being upon the right lung two fissu-res, dividing it into three lobes, whilst in the left there occurs a single fissure separating it of course into two lobes. These divisions are however subject to divisions varieties, there being in many instances as many as four lobes even upon the left side, forming thereby a resemblance to animals in which the number is often four or five upon each side. The trachea which communicates with the lungs is as I have before mentioned composed principally of imperfect rings to the amount of fifteen or twenty, here we have these rings all dissected out, and showing the space which remains in the posterior part unoccupied by cartilaginous substance. This space you see amounts to one third or one fourth of the whole ring. This is in the recent state filled out by the occurrence here of numbers of transverse muscular fibres, which attached by each end to the ends of the imperfect rings, and being lined like them by the mucous membrane, fill out the imperfection in the tube and render it a perfect cylinder. This layer of muscular fibres are very well shown in many of the preparations upon the table, and particularly so in this large one, in which they are very evident. The bronchia, into which the trachea divides, are also deficient in the same manner in the posterior third, being filled up also by

muscular fibres, at any rate until the become quite small, The action of these muscular fibres in contraction will be that of constricting the tube or rendering it smaller in diameter, by approximating the two ends of the cartilages, - this narrowing being also extended to the bronchia, This contraction of the tubes is a very important arrangement, as by it we are enabled to expectorate the viscid secretions of the parts, which under other circumstances could not be readily accomplished, - This in coughing, which is an effort for the removal of some irritating matter, - a full inspiration is taken, the tubes constricted and the air driven along them in this narrowed condition by the power of the muscles, clears away by its force all that may obstruct its passage, By this means it is that the mucous or purulent secretions of the lung membrane are removed against gravity. Around each of these cartilaginous rings there is a membrane like the periosteum or perichondrium, which after enveloping the ring is extended across an intervening space to the next one, thus connecting the whole chain together, This membrane is very strong and exceedingly elastic like india rubber, so that being stretched it immediately returns upon itself as you see, This is the ordinary yellow tissue which we have noticed in some other situations of the body, In birds particularly those where notes in singing are very varied, this membrane is elastic to the greatest degree, and may be seen undergoing instant modifications by watching the throats of these little singers whilst thus employed. The bronchia are divided and subdivided in geometrical ratio as the recede from the trachea, until the finally become so small as to be almost inappreciable, amounting to such a number as we can scarcely conceive of, ramifying throughout every possible part of the lung In these smaller divisions no rings are to be found they consisting after a certain point of diminution wholly of the elastic substance before spoken of. arranged as a homogeneous tube through which the air passes to the smaller tubes until it arrives at the terminal extremities,

Lect. LX.

Yesterday, gentlemen, we were engaged in examining the positions of the superior, anterior and posterior mediastina, and the various important parts contained within each particular one, — bringing particular attention at the same time to the various relations of these cavities formed by the reflections of the pleura around the two lungs. From the dissection now before us you will notice, — the pleura of the left side having been removed, — the particular position of the parts in the posterior mediastinum, and the relations which they bear to each other. We have here first to notice the great aortic trunk as it descends along the left side of the spinal column, — the arch turning over obliquely from right to left and thus descending into the abdomen. This arch is, speaking exactly, — in the superior mediastinum, but this is nothing more or less than the extension upwards of the posterior and therefore it is difficult to distinguish the exact line of separation. — This aorta then occupies the left border of this mediastinum, and at its upper part we see the trachea branching off to either lung, and not extending for any distance down into the space. Just behind the trachea we observe the oesophagus, coming down, and inclining to the left side as it gets down through the diaphragm in order to open into the stomach. We again notice here the situation of the vena azygos of the right side, — the vena azygos major as it is sometimes called, — and between this and the oesophagus, the great thoracic duct in its passage up to empty into the left subclavian vein near its junction with the internal jugular, conveying as it does all the nutritious elements which result from digestion. Near this again we have the left pneumogastric or pneumogastric nerve, in close contact with the oesophagus. Then we notice the vena azygos minor, brought into view when we raise the aorta from the side of the spinal column; this as you observe is not nearly so large as that of the opposite side. This vein arises from the lumbar and renal veins on this side, receiving some four or five of the the intercostals in its course up, — the remainder of them going to form a separate intercostal vein, — whilst the major on the other side receives all the intercostals of that side. This accounts for its superior size, until it receives this dim-

azygos which of course much increases its size toward its termination. You will notice the relative positions of the aorta and oesophagus here, and seeing that the arch of this great trunk crosses directly over the latter will be able to understand how an aneurism here may cause ulceration into the oesophagus, and the discharge of the sack through this route, as has been the case. As we have now gone carefully through these mediastina and examined their contents with some attention, we will turn our thoughts to some other points. You will notice here upon the muscular structure at the back of the trachea a number of little ovoid glands distributed over the whole surface and also upon the larger ram-ifications of the bronchia. These secrete a mucous which by means of their ducts is poured upon the surface of the mucous lining, to lubrify the parts and preserve them in a condition for the performance of their functions. We have noticed before in consideration of what forms the roots of the lungs that the division of the pulmonary artery formed one of the constituents. This vessel when it leaves the heart is as large as the aorta and of course in dividing forms large trunks, — we also saw the pulmonary veins as they left the lung carrying the now arterial blood back to the heart, and thus we are prepared to give attention for a very few moments to the theoretical views which relate to the manner of change from venous into arterial blood through the agency of the lungs. We have already observed the division of the lung into large lobes, but upon examining the surface closer we will see certain depressed lines running all over the surface of the lung, dividing it off into small irregular shaped spaces. These when examined are found to be lobules, or similar but distinct portions. In the foetus these can be distinctly traced out, and are there found to be the spaces in which one branch of the bronchia terminates. Thus it is supposed, — for the parts are entirely microscopic, — that the bronchia after having divided to a very great extent ultimately terminate in a cell or sack called a bronchial vesicle and that from this vesicle other smaller ones radiate all around. Now these are supposed to be formed of very thin membranous parietes, upon which the branches of the pulmonary artery are distributed, and from which the pulmonary veins

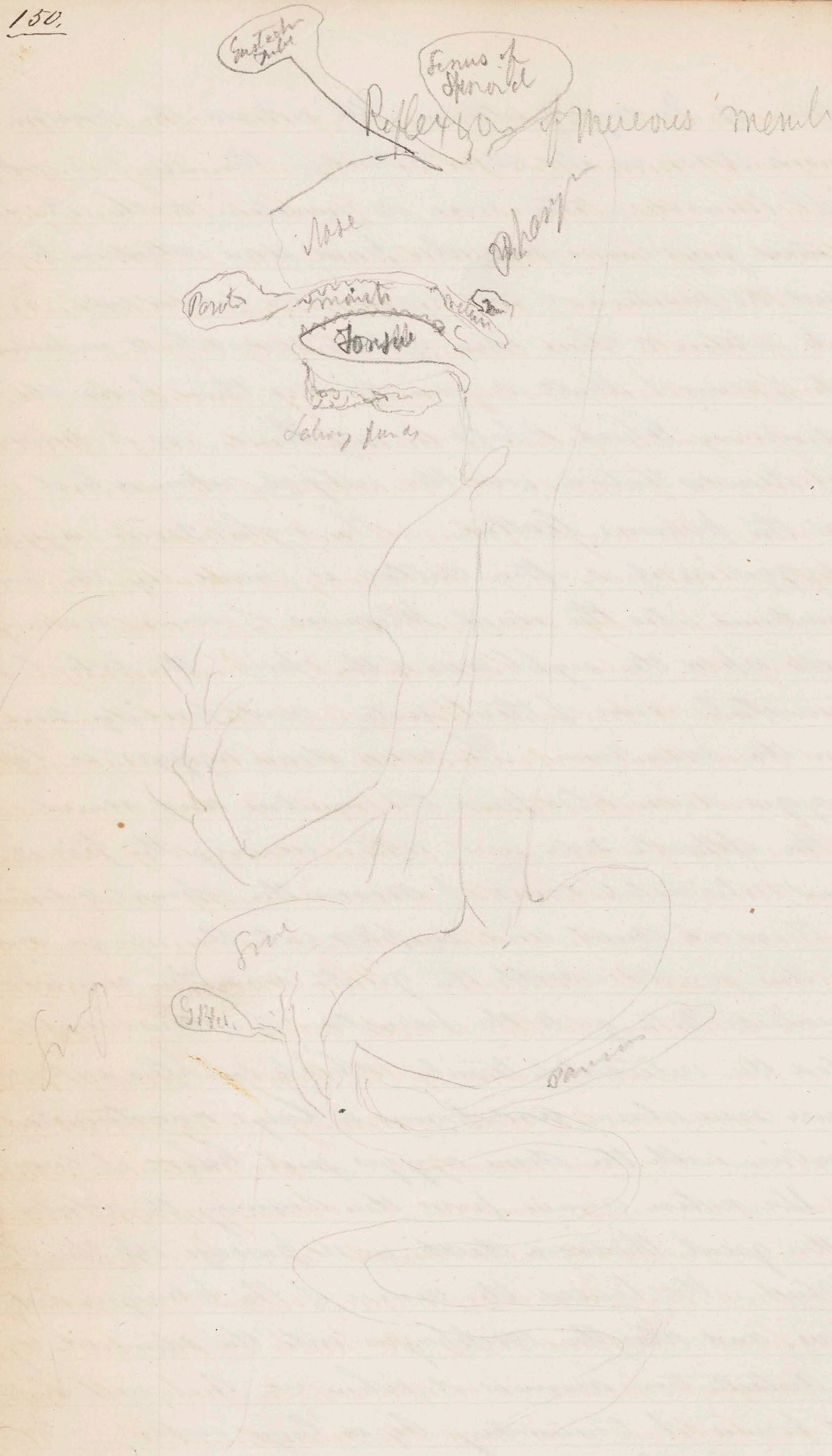
arise. If we add to these some nervous filaments and absorbent vessels, and suppose the whole connected together by cellular tissue, - we have the prevalent idea of the form-ation of one of these lobules - of which an infinite number go to make up the lungs. Upon this drawing in which the whole vessels are represented in different colours, you have a representation of this arrangement into the diff-erent lobules after the manner mentioned. These Bronch-ial vesicles although very minute, may be rendered apparent to the naked eye by filling the lung with mercury so that their existence as a terminal extremity to the bronchi are demonstrable, and the capillary division of the vessels is also apparent by the microscope, - So that in fact the uniting cellular tissue is the true parenchyma of the lungs. In ordinary breathing all these cells are not di-luted by air, - probably not more than one third or one half, - then lung always air existing in them beside. We now turn our enquiry into the mode by which the lungs are nourished, as they do not derive it from the pulmonary vessels which circulate upon the air cells. On the contra-ry there is a particular artery which is distributed to them for their nutrition. These are called the bronchial arteries and come off from the aorta to get into company with the bronchia whose ramifications and divisions they follow throughout the tissue of the organ. There sometimes ~~are~~ found two of these arteries upon each side, which however makes no variation in the distribution. These vessels at their divisions anastomose with the pulmonary vessels throughout. The nerves of the lung come principally from the par vagum or pneumogastric. This nerve which it is now proper to trace out to some extent in relation with these parts, - is one of the integral branches of what was called by old anatomists the 8th pair. This consisted of three different nerves, namely the Glosso pharyngeal, the Spinal Accessory of Willis, and this par vagum. This par vagum after emerging from the cavity of the Cranium, sends a branch to the pharynx and lary-nx called the superior pharyngeal, which with the branches from the upper ganglion of the sympathetic, from the glosso pharyngeal, and also from the lingual branch of the fifth pair, makes up the pharyngeal plexus which

you observe surrounding the upper part of the pharynx. In this we have too, some branches of the spinal accessory intermingled. The other branch given off near this point is the superior laryngeal, which it is necessary that we should study. This is a branch of some size and comes out from under the external carotid to be distributed with the superior laryngeal arterial branch. This nerve pierces through the thyro hyoid membrane to supply the mucous membrane, glands ~~&c~~ - sending of a single branch to the crico thyroid muscle, where it anastomoses with a branch presently to be noticed, - the recurrent laryngeal, and also with branches of the great sympathetic. This is as might be anticipated from its distribution, is the nerve which gives sensation to the larynx, making so peculiarly sensitive to all kinds of irritation. - It supplies no muscles whatever, if we except the small branch to the crico thyroid. A small ganglionic enlargement is observable upon this nerve before its distribution, where it receives some other minute branches. Thus we notice the branches given off by this nerve to the upper parts in its course and we shall continue to trace it out, as it is one of the prominent features of our course to give an exhibition of the parts in their natural relations rather than to separate them from each other and study them distinctly. This nerve as it runs its wandering course down to the heart, lungs and stomach, gives of branches to numerous structures, and has thus received the name of vagus. The nerves of the two sides vary in their courses, as they descend, the right one crossing in front of the ~~[illegible]~~ subclavian artery and then getting somewhat behind the ~~[illegible]~~ oesophagus - whilst the left runs down parallel with the subclavian and winding around the aorta gets upon the anterior side of the gullet. After getting into the cavity of the thorax it sends of a branch called the inferior or recurrent laryngeal, which again ascends to be distributed as its name imports upon the larynx. Now why does this nerve observe this peculiar course, of coming off down low in the thorax and then retracing the course of the parent trunk. Would it not seem to be more easy and natural that the branch should come off near to the point of its distribution? This is a large branch and the reason of its course

seems to be that it may furnish branches all the way along to the trachea and oesophagus, which thus get their supply of nervous influence. In the larynx, the particular object of this branch, it is distributed entirely to the muscles of the organ, thus completing the supply which was begun by the superior branch which we noticed supplied all except the muscles. Two branches are given off from this pneumogastric, to the heart which are called the cardiac nerves, - and which are united with others from the great sympathetic in order to form the cardiac plexuses. It gives off also branches to the lung which enter it with the vessels &c at the root. These form the line of association between the lungs and the larynx which is so important in respiration and the production of voice. These branches and their particular distribution are better seen from this enlarged drawing where the nerve of the one side is exposed to view throughout its course, in connexion with the parts to which it is distributed. We here notice the pharyngeal plexus surrounding the pharynx, - and then the superior laryngeal branch distributed to the glandular structures and mucous membrane of the surrounding parts, and anastomosing with the recurrent from below, - We then notice the inferior or recurrent as it is given off in the thorax and turns upward, supplying the parts in its course and being finally distributed to the muscular structure of the larynx. Again we see the two branches given off to the heart, upon which we find them intermingled with branches from the great sympathetic, - and then also the branches sent to the lungs. The greater part of which however come from the recurrent branch. One set of these run upon the posterior part of the root of the lung where they form the posterior pulmonary plexus, whilst an equal number of branches from the same nerve contribute upon the anterior face of the root of the lung to form the anterior pulmonary plexus. Thence they send out their branches upon their corresponding sides to accompany the vessels through the lung and give the necessary nervous supply. The cardiac branches you will see are given off upon the aorta and follow it down to the origin in the heart where they

are distributed as before noticed. The trunk of the pneumogastric after having given off these branches, is, on the left side, drawn in front of the oesophagus, where it is divided into a number of branches which inosculate with those of the opposite side. The nerve of the right side gets behind the oesophagus and descends thus hidden from view. It however divides like the former and the two together form a perfect plexus around the gullet. Thus you see that with this below, and the pharyngeal plexus above, this structure is most liberally supplied with nerves, being literally covered by them from top to bottom. The globus hystericus, which is so often spoken of and described, appears to implicate these nerves particularly, by throwing the tube into contractions in an upward direction so as to give the impression of a ball rising in the throat, and a sensation of strangulation or choaking. This oesophageal plexus is also seen to a greater advantage upon this enlarged coloured drawing, where its elements will serve to impress your mind better with its situation and arrangement. You notice here that after forming this plexus the trunk is continued down to the lesser curvature of the stomach upon which it is principally distributed, sending however two branches of some size down to the great semilunar ganglion. There are two other nerves the origin of which high up in the neck, we have before noticed, which go to supply the diaphragm exclusively, namely the phrenic nerves. These proceed down between the pleura and the fibrous pericardium until they arrive at the diaphragm, where they are distributed by a great number of branches to this great muscle, some of the branches being also traceable through into the substance of the liver, and also to the semilunar ganglion in the abdomen. The distribution of the arteries from the great aortic trunk to these surrounding parts will come next in order and occupy us at our next meeting.

Lect. LXI. In the lecture of Friday, gentlemen, we noticed the position of the thoracic duct in its ascent through the chest to empty into the left transverse vein near its junction with the internal ~~carotid~~ jugular, - and also paid some attention to the formation and disposition of the azygos veins of each side. To enable you to retain a clear idea of this somewhat important arrangement of veins, I shall again go over them from the enlarged drawing which I hold in my hand, - as it presents facilities for demonstration, over the subject, upon which we saw that at the previous lecture. The right vena azygos or major azygos as it is often called is formed by the lumbar and sometimes also the renal plexuses of veins, receiving as it ascends upon the right side of the spine, the whole of the intercostal veins of that side, and finally terminating in the vena cava. The vena demi azygos, or left or minor azygos arises also from the lumbar and renal plexuses on the opposite side and after receiving the five or six lowermost intercostal veins it crosses the spinal column behind the thoracic duct and empties into the azygos major. Above this junction with the greater vein the remainder of the left intercostals go to the formation of a considerable trunk called the intercostal trunk, which empties into the left transverse vein above, - and forms a large anastomotic communication with the demi azygos just before it crosses the spine. We notice again from this drawing the relative position of the great thoracic duct in its passage up the abdomen and chest. We traced the course of the pharynx into the œsophagus, and also the œsophagus into the stomach by the nervous distribution around it, when we last met in this place, - and found it terminating by a large orifice into the stomach, at what has been called the œsophageal or cardiac opening of this organ, so called in consequence of this being the nearest to the heart, - also sometimes called the left orifice of the stomach in consequence of its situation to the left side of the abdomen. This œsophagus is made up of three distinct coats which it has in common with the whole of the remainder of the alimentary canal. Namely, a muscular coat externally, a fibrous coat in the middle, and the mucous one internally. These several coats are exhibited upon these various preparations but in consequence of their natural redness are better shown upon an enlarged drawing, to those who are at a distance


Eustach tube
Sinus of Sphenoid
Reflexion of mucous memb
Nose
Pharynx
Parotid
Tonsils
Salivary glands
Liver
G.Bl.
Pancreas

The outer or muscular coat consists of two separate and distinct layers of muscular fibres, the one running longitudinally and the other transverse, of which the long fibres are the external ones and are continued the whole way down upon the stomach, not as individual fibres, but as a multitude of shorter ones arranged thickly together. When these are stripped down as they may very readily be, the next layer of circular fibres is brought into view; This only differs from the former in the direction of the course in which they run; The single fibres do not appear to surround the entire tube, but only to go half way or two thirds around when they are continued by others which overlap each other so that no part of the tube is left vacant. This arrangement we shall also find to prevail throughout the abdominal canal, and form thus a contractile coat of considerable power and great importance. Next to this muscular coat we have the fibrous one, which consists of condensed cellular tissue in which the vessels ramify, and which serves to connect the outer to the internal or mucous coat which we come now to consider. This mucous membrane is found to be common to the whole alimentary canal as well as to some other cavities of the body, and is found to be gradually converted into ordinary integument at orifices of external communication, as for instance upon the lips where it becomes sensible to ordinary impressions and converted in fact into a perfect cutis. The mucous membrane which lines the oesophagus, differs somewhat from that which we find lining the parts of the tube below it. In the first place it is of a whiter hue, the line of demarcation between this and the membrane lining the stomach being apparent to the naked eye and quite distinctive, but the principal difference lies in the character of the very thin layer which covers its internal surface, and which is apparent only before the microscope. The entire surface of the mucous linings wherever they may be found, are covered by a vast quantity of very minute transparent scales like the epidermis of the skin, called epithelium, the character of which from the form and arrangement of the scales, differs somewhat in the different situations in which it is found. That covering the oesophagus here is of the kind called tesselated epithelium, and is found

√ as well upon the mucous membrane of the vagina, cervix uteri and other structures. It consists on the skin of laminated scales overlapping each other like the tiles upon the roof of a house. These scales on the other mucous membranes are of a columnar shape being attached to the mucous membrane by their smallest extremity and lying one over another; they consist of a flattened cell which was previously of a club shape, containing a nucleus. When one of these or more are rubbed off as they are often discharged with the mucous, there are found new cells beneath, which quickly develope themselves and thus replace those discharged. These structures are however exceedingly minute, being only visible in a high magnifying power. We now pass on down to the stomach with which the lower extremity of the oesophagus is attached. This viscus we find to be of very variable shape and size, — about a normal condition of both is however represented by that in my hand. You will here perceive in this specimen which is inverted, the difference in colour of the mucous membranes of it and the oesophagus. — Indeed it was generally believed until very lately that the epithelium terminated at this cardiac orifice, but this has been proved not to be the case, there only being a change in the character. The oesophagus as you will notice is not inserted into the end of the stomach, but nearer the centre of the largest portion. This has given rise to divisions of the organ for purposes of description, into several parts. The opening at the other part of the stomach than the cardiac, of which we have spoken, — is called the pyloric orifice or valve from being constricted by a narrowed band. A little further up in this gradually narrowing portion of the stomach you observe a slight constriction or narrowing, giving a somewhat distinct appearance to the portion between it and the pylorus. — This is called the pyloric antrum or case of the pylorus. The oesophagus terminating at a point distant from the large end of the stomach, gives to this large portion the appearance of a sack and it is hence called the splenic, greater, or left tuberosity, or great cul de sac of the stomach. When in action the stomach has been noticed to assume by the contraction of some of the central transverse fibres by which it is surrounded, — a kind of hour glass form, which was also in some cases retained after death,

This has lead many physiologists to suppose that it is always thus contracted when in effective action in order to separate the grosser and less digested portions of the aliment from those which are chymified and better fitted for transmission. This is however not proven, although it is probable that in the action of digestion the food is retained in the splenic portion until it becomes advanced in the process, when the revolutions which it makes are extended towards the pylorus, but as this subject has already been ably treated of by the professor of Physiology, I shall not make a repetition. The stomach in common with much the larger portion of the intestinal canal - has in addition to the three coats which we found upon the oesophagus, - another serous one constituted by the peritoneum, which we have already examined. The muscular fibres here are unlike those which we have noticed upon the trunk and extremities, in their colour being pale and indeed almost devoid of colour, - this as before noticed, characterizing the muscles of organic from those of animal life. The external or longitudinal layer of muscular fibres upon the stomach is a continuation of that of the oesophagus, - but is not distributed equally over the entire stomach - being collected in a thick band along the lesser or upper curvature of the organ, whilst the remainder is more sparingly supplied. Next beneath this layer, there are found some fibres extending obliquely downwards and towards the splenic extremity, but this I believe to be only an accident from the mode of development of the organ, in the extension backward of this larger cul de sac, as they cannot be traced much beyond the cardiac orifice. In the child we know that this splenic extremity does not exist, - that the oesophagus enters at the extreme left of the stomach, and hence in the development of this cul de sac, some of the fibres heretofore transverse must be pulled into an oblique direction. This absence of any enlarged extremity, and the opening of the oesophagus into the extreme end of the organ satisfactorily accounts for the facility with which children throw off the contents of their stomach, it being then more like a simple enlargement of the intestinal tube. This also accounts for the fact that a pressure upon the stomach of a child will sometimes cause

an ejection of the matters contained. The drawing which I hold in my hand exhibits the three sets of fibres separately, the inner or circular ones running transversely around the organ, and growing more numerous as we approach the pyloric extremity where they are collected into a band as we shall see. When we open the cavity of a stomach we expose to view the mucous lining membrane which we find lying in loose longitudinal (for the most part) folds called the rugæ or plicæ. When the organ is inverted and distended as in the specimen in my hand, these folds are not found, - the whole surface being plane and smooth. The reason for this rugous condition is two fold, first, when the outer coats become distended by the matters thrown into the organ they yield from elasticity, whilst the mucous membrane not being elastic is not ruptured in consequence of its amplitude, - and again the extent of surface for the absorbing villi is also greatly increased in this manner. This mucous membrane we find to be much thicker and more vascular as it approaches the pylorus, thereby indicating the increase of functional importance, as we have already noticed that the principal operations of digestion were performed in the large cul de sac. When a portion of this mucous membrane is raised up, we see to what a great extent it is vascular, and find below it the cellular or fibrous coat, which was formerly called the nervous coat, as the ancients believed that all the white layer was composed of nervous ramification. This fibrous coat is that in which the vessels ramify and divide to the necessary extent. - it serving the same purpose for the stomach which the pia mater does to the brain as it is equally necessary that the minute subdivision should take place here. At the lower, smaller, or right extremity of the stomach we have a species of valve placed, called the pylorus, or janitor, placed here to prevent the passage of any thing which may be improper. This is a muscular and fibrous band say 1/6 of an inch in thickness which surrounds and constricts the passage, being covered by the mucous lining, and thus rendered somewhat thicker. This is simply a sphincter arrangement, and precisely analogous to the internal sphincter of the rectum which we have had occasion to notice as a mere collection of the circ

-ular fibres in one situation by which an increase of power was attained, This valve is acted upon by the quality of the matter which presents itself for passage, as that alone is admitted which has been fitted by the digestive process to pass on into the parts where the absorption of the chyle is effected. The mucous membrane of this organ will require a more minute examination from us, which will however be postponed until we speak of that of the small intestine, with which it is common & identical in character. This organ, as will be seen by the specimen which has been injected and inverted, - is exceedingly vascular, the veins having a great preponderance over the arteries in number, although these last are very numerous. For the sake of preserving relations which is the distinctive feature of our course we shall consider the whole of the chylopoietic viscera in the order and vicinity in which they are found. The next subject for consideration is then the duodenum which is a short portion of the intestinal canal continuous with the stomach above and the jejunum below, deriving its name from being of about the breadth of twelve fingers in length. The calibre of this portion is somewhat greater than that of the small intestine into which it is merged at the lower end, This duodenum for the greater part of its course is not covered by peritoneum, being excluded as noticed between the folds of the mesocolon, but directly in contact with the back walls of the abdominal cavity. It is therefore like the oesophagus devoid of any serous or peritoneal covering. Where it lies outside of the peritoneum it appears to be dilated or increased in size, as noticed in the specimen, than which it is sometimes found three times larger, This increase in size has been considered as making it analagous to the second stomach in animals, and it has therefore been called by some the ventriculus succinturiatis succenturiatus. In this dried specimen of the duodenum you see its natural shape and extent, forming three sides, as it were of a hollow square the one end communicating with the stomach and the other with the jejunum, Into this square the head of the pancreas is received filling it completely up and throwing its excretory ducts into it at this point. When we invert the duodenum as has been done in the preparation

no valve at cardiac orif. altho' of the numerous. ✓

before us, we find the surface interspersed with rugæ or plicæ, the folds not however as in the stomach, running in a longitudinal direction but transversely. The folds are however of nearly the same character as those of the latter organ, only that between the layers of lining membrane there is some of the fibrous or cellular coat. These transverse folds are called from their direction the valvulæ conniventes, or from the anatomist who first described them, the valves of Kerkringius. These do not extend singly entirely around the intestine, but after passing ~~one half~~ or two thirds or 3/4ths of the distance they cease and another commences along side which continues the remainder of the distance and in length overlaps the other extremity of the first. They also often communicate with each other by means of longitudinal or oblique strips or folds passing between. Thus the surface is very much covered by this means leaving the interstices limited. The function of these folds is not as in the stomach to allow for any particular distention, which cannot take place here to any great extent - but appears to be an arrangement for the purpose obstructing the otherwise too quick passage of the chyme along its course, when by sufficient time would not be allowed for the absorption of the nutritious particles by the villi of the canal. - It is also doubtless very useful in giving greater amplitude of the surface for the accommodation of a greater number of those villi which so thickly stud the whole surface of the upper small intestine. To such an extent is this folding carried in the greater part of the alimentary canal that if the mucous membrane were dissected up and stretched out to its full length it would measure double that of the other coats. They are very numerous in the duodenum and jejunum but less so as we decend farther. The position of the lines we noticed upon a former occasion, with relation to the situation of these viscera, and we will now take up the arterial distribution by which these parts are supplied. This is by means of a large trunk coming off from the abdominal aorta soon after its passage through the diaphragm. This is called the Celiac artery or axis, which very soon divides into three great branches

The first of these is called the hepatic artery from being distributed to the liver principally. It however divides and sends off a large branch called the right gastric or gastro epiploic artery which after branching around the pylorus, passes along the greater curvature of the stomach sending numerous large branches to the omentum. The main trunk of the hepatic artery then divides into two branches called right and left from the lobes of the liver which they supply. The next branch from the coeliac is the gastric or superior coronary artery. This is of considerable size although the smallest of the three. It runs from its origin directly to the left or cardiac extremity of the stomach where its branches surround the cardia and oesophagus, from whence it follows the lesser curvature of the stomach to the pylorus where it inosculates with other gastric vessels. Next we notice another branch from the hepatic called the left gastric or inferior gastric which runs along the greater curvature from left to right until reaching the pylorus it anastomoses with the superior coronary at this point. We next have to consider the Splenic artery which is generally the largest of the three great branches. This after its origin becomes imbedded in the pancreas to which it gives a great many branches. From thence it proceeds to the spleen giving off in this course generally four or five short branches which pass across to the stomach. These are of considerable size, and in this case only three in number. They are distributed to the stomach, and anastomose freely with the other vessels of this viscus. Upon coming near to the spleen the ~~main~~ artery divides into three or four branches which enter the organ through a fissure in it, and ramify through its texture. Thus we see that the stomach has a great quantity of arterial blood supplied to it being literally surrounded by vessels of large size and from various sources. The various anastomoses of which, and their guarded situations denote well their very great importance to the performance of the functions which belong to this very important organ.

**Lect. LXII.** I wish to call your attention to day, gentlemen, in connex-ion with the upper part of the alimentary canal, - to the largest glandular organ in the human body, namely the Liver, - and one which more than any other is subject to variations in size form and weight. We have in the two specimens before us, this fact well exhibited, as nei-ther of them are in an unnatural condition. The one is about one foot in breadth, whilst the other when spread out in the same manner is not so broad by some inches, and yet if weighed would be found to be a pound or a pound and a half heavier on account of its increased thickness. The ordinary weight of a liver is ~~about~~ three to four pounds. This gland as you know is convex above, and somewhat concave below and lies in im-mediate contact with the lower surface of the diaphragm. It is covered both above and below by peritoneum, the refl-ections of which off to the diaphragm forms the so called liga-ments by which it is suspended in its proper position. These ligaments are three in number, a central suspensary or falc-iform, and on each side one lateral or coronary ligament. Beside this serous peritoneal coat which it has in common with almost all other viscera of the abdomen, - it has like other glands, - a proper capsule or fibrous coat, investing it entirely. The liver is divided into a number of different lobes, formed upon the sulci which traverse its inferior surface, and by the suspensary ligament above. The first of them to be noticed is what has been called from its direction, the great longitudinal fissure. This is situated in the median line of the body ~~and~~ upon the inferior surface of the liver, - and with the suspensary ligament above, divides the whole organ, somewhat arbitrarily into two great lobes, - right and left. Of these, the right is very much the largest, as we have already seen on more than one occasion, - the left varying greatly in size and shape in various subjects, - being more subject to obvious variation than the right. In some instances it extends over to the left of the stomach forming a large but thin lobe, whilst in others it is much more confined, - present-ing a mere ledge or projection from the right, - This latter is also liable to great variety in its shape and extent, often projecting beyond the cartilages of the ribs and sometimes even extending to the crest of the ileum, - When it extends lower than is usual, it often bears the impress of the colon or en-

the kidney, - the same even in the natural position often giving a superficial concavity near the anterior margin of the viscus. This right portion is generally five or six times as large as the left, - this and its arrangement being however the only difference between them. The right lobe is divided into two portions by another fissure which leaves the longitudinal one at right angles, running outward. This from its direction is called the great transverse fissure of the liver, and lodges the vessels, ducts, nerves and absorbents, in their entrance to or departure from the organ. These fissures vary very much in depth in different specimens, from a difference in the thickness of the viscus, and are hardly to be found alike in two cases in succession. This transverse sulcus, divides the right portion into an anterior and superior portion, and a posterior inferior portion, which again have their subdivisions. - The ascending vena cava in its course to the heart has to pass either by or through this posterior inferior part. Sometimes it passes upon its anterior face, only making a groove or furrow through or on the surface, whilst at others
pons hepatis it passes through its substance, leaving a kind of bridge of hepatic substance anterior to it. This generally ascends in a direction parallel to the great longitudinal fissure, and some distance to the right of it, thus making a subdivision in this posterior inferior part and the separated portion lying between the great vein and the longitudinal fissure laterally, - and between the transverse fissure and the lower margin of the organ, - is called the lobulus Spigelius, from the anatomist who first described it. The great vein not not extending entirely to the transverse fissure entirely, leaves a portion of this lobulus Spigelii projecting outwards and forming the posterior boundary of this fissure. This is called the lobulus Caudatus from its being a tail like appendage to this portion of Spigelius. - A fourth portion which has received a name, is called the lobulus Quadratus. This is formed upon the anterior division of the right lobe, by the superficial sulcus or depression made by the gall bladder which lies parallel with the longitudinal fissure and sends its duct into the transverse fissure. The portion between the gall bladder and the longitudinal fissure laterally and the transverse fissure below, and the anterior margin above, is the lobulus Quartus, or Anonymus as it is some

-tims called. This lobulus quartus has at its posterior end ~~a~~ a somewhat projecting angle formed by the separation of the ~~trans~~ transverse from the longitudinal fissure, - which is likewise the case in a more marked manner upon the lob-ulus spigelii below, - and these two projections jutting out towards each other form what has been called the porta or gate way to the liver through which the vessels pass to get into the transverse fissure from which they branch out to the various parts of the organ. These vessels, nerves and ducts as the pass through this gate-way are surrounded by a peculiar structure, called the Capsule of Glisson, as from its colour and consist-ence it was believed by Glisson to be concerned in the portal circulation by exerting a muscular force upon the vessels. This is however now known to consist only of some condensed cellular tissue, and to receive its red-dish colour from the colour of the circulation through it as that of the liver, as the lymphatic glands and vessels have the same tinge and from the same cause. We next notice the great trunk called the vena porta which we find entering the organ through this capsule of Glisson. This is unlike any other vein in the body, as instead of carrying blood from a capillary tissue of vessels into large trunks, - it distributes blood to a capillary tissue in the liver, thus acting the part of an artery. This has given rise to the distinctive term which is sometimes applied to it of "the arterial portion of the venous system of the liver" which although some-what paradoxical, is not a bad distinction. This gi-ent trunk is a condensation of all the venous blood of the abdominal ~~cavity~~ viscera into a single trunk, with the exception of those from the kidneys, which venous blood having already gone through one capillary circulation in the parts to which it was distributed by the arteries, is now collected in one trunk to undergo another distribution through the liver before it is allowed to pass back to the heart. For the purpose of this second capillary division it might be imagined that another force was needed, but this does not appear to be the case, - as there is not even any elasticity in the vein as there is in arteries which have to perform this function of distribution. After passing in

-to the ~~transverse~~ longitudinal fissure the vena porta divides opposite to the great transverse fissure into two branches, which lea-ve it nearly at right angles, one to each lobe of the organ, At the division ~~one of these~~ there is a considerable enlarge-ment in the vein, which is called the great sinus of the vena porta. The branch to the right lobe is as you see much the largest in the adult subject, but this is by no means so in the foetus as here the umbilical vein bringing blood in from the placenta empties itself into the left branch, another vessel which is the ductus venosus passing out to join the hepatic vein from an opposite point of this right branch, but not being so large as the umbilical vein, Thus a portion of the placental blood is forced through the liver by means of the vena porta, whilst a portion passes directly to the heart by the hepatic vein through the vena cava These veins are in the adult generally degenerated into a kind of ligament, both of which may be here distinctly seen, They are in some rare cases found pervious to a greater or less extent, which you see is partially the case in the instance before us. The round ligament of the liver you know is made of the remains of this umbilical vein This vena porta subdivides from these two main bran-ches in the substance of the liver into very minute or capillary vessels, and is followed in this branching by a sheath of the cellular tissue which forms the capsule of Glisson, - being surrounded thus in each ramification as far as can be traced. This serves to distinguish it wherever found from the ramifications of the hepatic vein which being closely connected with the hepatic sub-stance cannot readily collapse, Thus when a section is made in the liver transversely to the course of these ves-els, the branches of the vena porta are found to be collapsed like ordinary veins, as they have an indep-endent sheath, whilst the hepatic veins are seen wi-th open mouths from their walls being continuous wi-th the substance of the liver in which they run. We have passing in through these fissures, also the hepatic arteries branching to each lobe as mentioned in yesterd-ay's lecture, when considering the branches of the coe-liac trunk, This artery ramifies and divides into

capillary ramifications in the substance of the organ, being sent there as many believe only for the nutrition of the liver, in the same manner that the bronchial arteries are sent for the nutrition of the lungs, - and not for the secretion of bile, which these physiologists think is secreted from the venous blood of the vena porta. This as yet is with many a contested point, although as we shall see, some light has of late been thrown upon the subject. - The arguments urged against this latter opinion are deduced from some cases in which the vena porta is said to have emptied into the vena cava, without having gone through the liver at all. One such case in a preparation of Mr Abernethy was however found upon close examination to be not virtually the fact although the trunk which was considered to be the vena porta, did empty immediately into the vena cava, other branches being afterwards found which passed to the liver. This hepatic artery and its ramifications are also surrounded by sheaths from the cellular tissue of the capsule of Glisson. - The Billiary ducts which also pass through the portae of the liver, are collected together into large trunks in the substance of the organ and finally into a single one from each lobe. When the substance of a recent liver is cut into these billiary vessels may be seen from the bile which exudes in little drops upon the surface from their divided ends. These are what were called the pori billiari by the older writers. The last set of large vessels distributed through the liver are the proper hepatic veins, as distinguished from the portal veins. These are called sometimes for distinction the venae cavae hepaticae. These have no sheaths as before remarked, and discharge themselves into the great vena cava whilst it is passing through the liver. Some of the mouths of these vessels are very large as you see by opening the vena cava, whilst the whole surface is studded over by thousands of smaller mouths by which they discharge themselves. When the tissue of the liver in a recent state is torn asunder we notice that the surface has a coarse granular appearance, being covered by small rounded bodies also

-ut the size of millet seed, and all in connexion with each other. These are what were formerly designated by the inexpressive term of acini, which has caused a great deal of confusion in anatomical science from the diff-erent construction put upon it by various authors some using it in quite a different sense. It has unfort-unately been applied to more parts than one of the human body, particularly by Malpighi. These bodies of the size of a millet seed are however when examined more closely found to be polyhedral in their shape, having five or ~~six~~ regular sides by which they are so applied to each other as to leave no space unoccupied by them, or the structures which partly compose them. When these Acini are examined under a powerful microscope, as has been done by Mr Mathew Kiernan they exhibit a very interesting arrangement to explain which in the most comprehensible manner we have resorted to some diagrams upon the black board representing the appearances. We must remember to start from that there exist four distinct sets of vessels ramifying through the liver, two of which carry into, and other two out of the organ, - The diagram represents two or three of these acini or polyhedral ~~bodies~~, or lobules as they are call-ed by Mr Kiernan, which are separated with the different sets of vessels arranged through them as he sup-poses them to exist. First then we have the vena porta subdividing into capillary vessels, which surround each and every one of these lobules, sending of into them from every part of the circumference little branches towards the centre, These he calls the inter lobular veins and from these he supposes the bile to be secreted by a sort of exosmosis into the biliary ducts which are represented on the other figure as having the same arrangement, only carrying their contents of course in a different direction, - their larger ramifications being also interlobular, and finally collecting ~~collection~~ into the larger branches which become the hepatic ducts, Thus we see he believes the bile to be secreted from the venous blood of the portal vein. In the centre of each of these lobules, and branching out in various directions, he finds the radicals of the vena cava hepatica and these he calls the intra lobular veins

and believes that they receive the blood after the bile has been secreted, - emptying into successively larger trunks until they finally terminate in the vena cava ascendens This idea is somewhat supported by the fact that an injection into the portal veins will not pass through into the hepatic veins unless a considerable amount of force is used, under which circumstances however both sets of vessels may be injected from the same point. The hepatic arteries which he supposes are sent only for the nutrition of the viscus, follow the ramifications of the portal vein, become interlobular and finally after distribution in the structures terminate also in the intra-lobular veins or venae cavae hepaticae. The larger branches of the vena porta he distinguishes as the vaginated veins from their being sheathed in the cellular tissue before mentioned to prevent us from confounding them with the interlobular or smaller divisions. This System or theory of the secretion if perfectly established by successive observation will set at rest all the various hypotheses with regard to the performance of the functions of the liver, and has the advantage of accounting for a great many phenomena which were before very ambiguous. Thus we may have any one of these systems of the liver in a state of congestion imparting its peculiar character and colour to the organ, - for instance if the the billiary apparatus becomes hypertrophied from any cause we shall have a yellow colour imparted, - if the interlobular vessels are in a congested state we will have a dark appearance, and if examined closely, - what has been heretofore called by some writers a cortical congestion in as much as there will not be such discol-ouration in the centres of the lobules, - then if the intra-lobular system be congested, there will be a medullary congestion, where the cortical part is free, - and this form will arise from obstructions or regurgitations at the heart by which the passage of the blood is impeded. We must now examine for a moment the means by which the bile is discharged after having been secreted and collected in the manner which we have supposed in the lobules. The ducts which emerge from the substance of the liver unite at the transverse fissure and

after continuing for one or one and a half inches are join-ed by what is called the cystic duct or that of the gall bladder. These two make up a common duct of very considerable size which is called ductus communis cho-ledochus. This common duct is about three inches in length, and of the size of a small quill; - it leaves the longitudinal fissure of the liver enclosed in the capsule of glisson along with the vessels and nerves, and goes to discharge itself into the duodenum. It pierces the coats of this portion of the intestine in a very oblique direction, entering the mucous coat about three or four inches below the pyloric orifice of the stomach on the outer side of the intestine. This opening is rend-ered conspicuous by an eminence of a papular form upon the mucous surface, which tubercle is probably composed of an erectile tissue which is sensitive to the peculiar impressions which produce the flow of the bile - similar to the female nipple. When a probe is passed in from the duodenum you notice the very oblique direction of the entrance of the duct, which effectually prevents the entrance of any foreign substance from the cavity of the intestine. The mucous membrane which lines the duodenum is continued up this duct lining it probably throughout its ramifications even in the substance of the liver. This fact accounts fully for the transmission of irritation to the liver in cases of inflammation of the duodenum, which is often known to give rise to irritative affections of the liver. This mem-brane is also extended up the cystic duct to the gall bladder the cavity of which it also lines throughout. This gall bladder is lodged, as before noticed on the anterior lobe of the liver, upon its surface, where it is held by the peritoneum being reflected over it, hence it must be evident that the portions of the liver and gall bladder which are in contact cannot have a coating of peritoneum. When this peritoneum is stripped off of the bladder we discover below it a fi-bro dense fibrous coat which is lined on the inside by the mucous membrane of which we have spoken. The cystic duct, or outlet of the gall bladder has something peculiar in its arrangement which we must notice at the commencement of the next lecture.

Lect LXIII. For a few moments, gentlemen, I wish to call your attention to some remaining points in the structure of the gall bladder left unfinished at our last meeting. The mucous membrane which we noticed as passing around its cavity is continued down the duct by which it communicates with the common duct. This which is called the cystic, is however lined in a very peculiar manner the membrane being arranged at the termination of the gall bladder, into spiral folds some-what resembling the corkscrew. These folds are several in number varying however in the various subjects in which they are examined. The construction seems to have for its object the preventing of a too ready transmission of the bile through the duct. In the enlarged representation which I hold in my hand, wherein the mouth of the bladder is laid open, - the peculiar arrangement is very well exhibited. The coats of this duct are analagous to those of the gall bladder itself, having a middle fibrous one which altho-ugh not muscular, is still eminently contractile, being composed of fibres which shorten themselves by producing a kind of honey comb indentations in the tunic by which it is diminished in extent. These depressions are also lined by the mucous membrane ~~so~~ that this character is given to the whole inner surface of the ca-vity. This mucous membrane is attached to the fibrous coat by some loose cellular tissue which covering the whole surface might be considered as another coat. - outside of this fibrous coat you have a portion of it covered by the serous covering of the liver, whilst that which is in cont-act with the organ, is not covered in this manner, as before mentioned. The mucous lining is studded with an immense number of mucous follicles, as well as its prolongation through the duct. These must secrete, of course a considerable quantity of mucus, and the enlar-gement of the gall bladder in children, which is frequently noticed, must consist mainly in the excessive secretions from these follicles. The bile contained in this viscus is doubtless the inspissated secretion of the liver, which is transferred into this place by a process which is not well understood, - as by the ducts, and it has no other way of passing, - it must ascend the small and ordinarily coll-apsed duct, against gravity, after having descended the

proper hepatic ducts from the liver. Some anatomists have immagined that this Cystic duct was a kind of arch-imedean screw by which it was drawn up. but this idea is of course untenable, The mode is as yet unknown unless it be that the mouth of the Common duct into the intestine is closed by contractile force except during digestion, and that the bile thus arrested must find some other passage, although little is secreted during these periods. The bile found in the gall bladder, is that alone which presents to us the familiar characteristics of this fluid, namely its consistence and bitterness, - for that in the liver is never bitter as we know from the edibility of the organ which must contain a considerable quantity. It is probable that this Cystic bile when needed, in the process of digestion is forced out by the fibrous coat of the bladder and by the succussions of the abdominal muscles. so as to flow along the ducts to the duodenum with that which is secreted by the liver at the same time, We next have to consider another organ which is connected with this upper part of the digestive tube, to wit, the Pancreas, or as it has been called with apparent propriety the Abdominal salivary Gland, This is situated deeply in the cavity of the abdomen, - below the stomach, crossing the vertebral column transversely from left to right, - and lying immediately upon it. This organ is of a somewhat club shape, having a small and large extremity - and is divided into three portions the right or larger end, is called the lesser pancreas or head, - the next portion the body, and the smaller extremity which lies upon the left side is called the tail of the pancreas. In a normal condition it is from six to seven inches in length. and the breadth of the head fills up the cavity made by the elbows of the duodenum to which it is firmly attached. The tail of the organ is connected with the spleen from which it lies by the arteries and veins which pass to that organ, Unlike the other glands throughout the economy this pancreas has no proper capsular covering of a fibrous character, being merely surrounded by some loosely collected cellular tissue, somewhat thickened so as to cover it in, - neither has it a proper peritoneal coat, as it is connected with the duodenum, When you tear up the cellular

coating which it has, you bring at once to view the large granules or lobules of which it is composed joined together as in the salivary glands. This organ receives a large supply of arterial blood and secretes from it a pec-uliar fluid which is poured into the duodenum by means of two principal ducts which unite and open generally into the ductus communis choledochus just before it pier-ces the coats of the intestine, although it sometimes emp-ties directly into the intestine. The larger pancreatic duct commences at the tail or splenic extremity and passes directly through the organ until very near the intestine it receives another and smaller one from the head or lesser pancreas. The fluid thus conducted into the int-estine is in almost every respect like the saliva, only differing in not containing a small quantity of sulpho cyanic salts, having the other mucous and saline characters of the saliva. From being thus provided and thrown in with the bile we may consider it essential to the functions of the digestive tube and therefore of importance. The spleen which comes next in order is found in the left hypocho-ndriac region, upon the outer side and a little below the level of the stomach to which it is always conn-ected by the reflection of the peritoneum from the one to the other on each side, thus forming what is called the gastrosplenic omentum. The spleen is very various both as regards form and size being usually of a flattened ovoid shape and about four inches in length. From this it may be much diminished, or enlarged to a great many times that which is normal, - sometimes to the extent of weighing 10-20 or even 30 lbs as has been said by writers. In such cases of course it descends out below the ribs, displacing all the viscera by its size. Besides the peritoneal coat which it gets, it also has a proper fibrous capsule which is very elastic or distensible, and admits of its being enlarged to a great extent, naturally, and prevented from rupturing by such distension. This coat is of material similar to that between the vertebra, called tissu jaune. When portions of the spleen are macerated and examined, we notice that from this fibrous coat run in partitions or septae towards the centre, dividing the whole viscus into a number of cells, precisely like an orange in which such partit-ions exist. These cells contain as you see a thick clotted

substance, which during life is most probably in a fluid state. Into these cells, subdivided as they are, it is supposed that the arteries which are very large, pour their blood, - from which it is again collected by the great splenic vein, the largest in the ~~body~~ abdomen with the exception of the vena porta which it contributes more than one half to form. As regards the internal anatomy of the spleen as well as its precise function in the body anatomists are entirely at fault. Injections into the veins are found to terminate in small rounded sacks. the entire tissue seeming to be composed almost of minute blood vessels which pass into and out of it through the fissure. Although its precise function is problematical, we know that it serves the purposes of a diverticulum of blood when it is not used in the digestive function and also under some other circumstances, as for instance when children you all remember, no doubt that on running some distance, or in any violent gestation exercise, the sharp pain which attacked you in the left side. This pain was seated in the spleen and probably caused by the distension which it had undergone in consequence of the increased quantity of blood which it was obliged to hold. The enlargements of this organ constitute what is called ague cakes when occuring after intermittent fever, - and the specimen in my hand is an example of this ague cake. When thus enlarged it is very fragile, and easily torn. Although somewhat ambiguous, there is no doubt but that this organ has some important function in the economy, even though it seems to have been removed from animals, and even from man, where portions of it have protruded in wounds of the abdomen, + without causing any appreciable inconvenience. A very interesting fact connected with this organ is that in those foetuses which have been born without a brain, although some of them have lived for a short time, - have also wanted the spleen. The dark brown granular mass of the spleen, has a great many nerves and absorbent vessels passing through it, and Bourgery a French anatomist says that he has also found in it a great number of minute lymphatic glands. This I have often looked for without effect, and would rather suppose that the existence the functi

or crossings of the septa for glands of this kind. This
Spleen cannot with propriety be called a gland as it
has no secretory duct, and may be considered an equivo
-cal organ. We are next prepared to go on in the con
-sideration of the small intestine of which the duodenum
already noticed is considered to be a part. That which
we have now to examine extends from the duodenum to
the Colon, varying in length in different subjects from
fifteen to twenty five feet, without there being any indic
-ation during life, of such a difference. The specimens upon
the table vary considerably from each other in this respect
although they both occupy a medium of length between
the extremes noticed. This long tract of small intestine
is divided into two portions the jejunum or upper portion
so called from its generally being found distended by
air and devoid of feculent matter, - and the ilium, so
called from its [illegible] & twist ~~termination~~ in the iliac fossa of the right
side. - The first comprises the upper half or two fifths
and the other the remainder, their line of distinction
being entirely arbitrary, and not to be naturally detected
On examining the middle or any portion of the one with
a corresponding part of the other, it will be found that
the jejunum as a whole, is the largest, being gradually
reduced to the size of the ilium. These small intestines
have the same four coats which we found upon the
stomach, and it is therefore not necessary to repeat the
demonstration of these. They lie all convoluted and fol
-ded up in the middle of the abdominal cavity, which
fact will be obvious when we know that the two ends
of the canal are not more than five inches apart
when in their natural situation. They are attached
to the spine, and kept in position by the reflection
of peritoneum which we have before noticed as the
mesentery. This covering the whole length of the tract
and being inserted upon the spine, must be of a
somewhat triangular form, and from the length of
the canal it must be clear that they are doubled
upon themselves a great number of times, in order to be
thus attached to a comparatively small distance upon
the spine. In this mesentery, as you see when I hold it
up to the light there are a great number of small lymph

-hatic glands, called the mesenteric glands, through which all the chyle has to pass before reaching the great thorac-ic duct. In marasmus these glands become enlarged and swollen in such a manner as to obstruct this flow of chyle and the patient is maintained in a state of de-praved nutrition which if not arrested terminates in death from inanition; There is also a difference between the jej-unum in the number of the valvula conniventes, which occurring very frequently in the upper portions are diminished in number as they descend, until the lower part of the intestine is free from them entirely and presents a plane mucous lining. These valves are composed as in the duodenum of mere dup-lications of the mucous membrane united together by a small quantity of cellular tissue, and their use is to obst-ruct the rapid passage of the digestive matters, and to inc-rease the mucous surface, This mucous membrane is cove-red by immense multitudes of little villi as they are called standing out from the surface like the pile or nap upon velvet, and in their collective state are even visible to the naked eye, The ileum in which the valves are much less frequent, becomes as before noticed much smaller at its lower end and finally terminates by a peculiar arrange-ment in the large intestine as it is called from distinction. This large intestine constitutes the remainder of the ali-mentary canal, and is found to commence in the right iliac region, - to ascend nearly vertically on the right side until it gains the region of the liver when it crosses directly over below or in front of the stomach, and again descends on the left side to terminate finally ~~at~~ the ~~rectum~~. anus - This forms a kind of hollow square space in which the great mass of the small intestine are lodged when the natural situation is not disturbed, The large intestine is divided for description into several portions, as the cæcum, ascending, transverse, and descending colon, - sigmoid flexure of the colon and the rectum, The ileum does not terminate at the very commencement of the large intestine but into the side of this at a short distance above its commencement, - hence there is a blind sack or pouch alone which is called the caput coli or cæcum, The next portion is much longer and is called the colon, being divided as mentioned into four parts, the three first according to the direction, and the last is termed the sigmoid flexure in

consequence of being turned in the form of an italic S. This flexure terminates in a short portion which from its straightness has been called the rectum. The opening of the ileum into the colon is formed in such a manner that a portion of the sides of the aperture project into the opening and form a valve to it by which the upward passage of the contents of the colon along the small intestines is under ordinary circumstances prevented. This opening it as you see of an oval or eliptical shape, and when the valves are pressed down, is closed entirely. This is called the ileo colic or ileo cœcal valve, or valve of Bauhin, and although under natural circumstances is fully efficient, yet after death we can force injections to pass it and gain the ileum, also during life under circumstances of strangulation below the valve the matters are frequently carried by by the inverted peristolsis and ejected through the mouth, constituting what is known as stercoracious or fecal vomiting, for after having passed this valve or having come down in the Ileum near to it only do the alimentary matters become fecal from the characteristic odour which they here acquire, - This smell is supposed to be derived from a peculiar secretion taking place into the large intestine. The cœcum or head of the colon is as before mentioned a pouch in which fecal matters sometimes accumulate, - and has attached to it a long appendage, somewhat resembling an earth worm in form and size, - from which it has received its name of Appendix vermiformis cœci. This is formed of all the coats of the intestine and is sometimes found floating loose in the cavity, and sometimes around an intestine, or fastened as in this instance to the side of the colon by the peritoneum, - when fastened around an intestine it sometimes becomes a fatal cause of strangulation. It has also been known to be attached to the kidney or liver, in some cases. The use of this appendage in man is not known whilst it frequently becomes the source of most disastrous disease and death. Thus when fæces become impacted in it, they are out of the course of circulation and lie there until by the irritation which they cause, ulceration and perforation ensue, upon which follow peritonitis and death in a majority of cases. A cherry stone or watermellon seed or any other like body may cause the same occurrences, in which the only salvation is the quick inflammatory adhesion of

the opening, and the prompt measures to allay peritonitis, It was from such an affection that one of the most promising Alumni of this College lost his life last Spring. The wonder is in these cases, not that such things occur, but that they do not constantly happen from the exposed circumstances. The Colon is not a continuous even tube as the small intestines are but, is arranged in the form of pouches or cells, which give to it an irregular form, both externally and internally This is formed by the aggregation of the longitudinal fibres being collected into three bands, instead of being equally distributed as before; - One of these is seated opposite the mesentery and the others, one on each side. These are so shortened or contracted as to pucker up the other coats and thus form by the contraction also of some of the circular fibres, these pouches. Now in the foetus this arrangement does not obtain the whole intestine being a smooth tube, - but as development goes on, - the other coats are increased faster than these longitudinal fibres, and hence the result. These cells are supposed to be intended for the retention of the faeces until the fluid is absorbed from them. as previous to this point they are always more or less fluid. We now pass to the rectum which is the straight portion of the large intestine contained in the cavity of the pelvis, Here the longitudinal and circular fibres again become readily distributed over the bowel, the whole of the coats become darker and stronger and the fibres regain the colour of which we found them possessed in the oesophagus. Towards the extremity we find it becoming narrowed by a collection of the fibres, until at the anus these completely close the cavity, constituting the internal sphincter. The mucous membrane is here more loose and filled with vessels which are liable to become varicose and constitute piles of which an incipient state is seen in the specimen before us. These piles may be seated either within the sphincter or in some cases higher up so as to be hidden from view, Just inside the sphincter we have a number of small pouches first pointed out by Dr Physic, which sometimes become the ~~seats~~ lodgments of small quantities of faeces, and give rise to abrasions of the membrane, and a great deal of pain and difficulty. The longitudinal fibres descend and form loops around the internal sphincter as first pointed out by Dr Horner, arising to be inserted upon the inner side of the rectum

Lect. LXIV. Having with yesterdays lecture gentlemen, finished the consideration of the general structure situation and divisions of the alimentary Canal, together with those which are closely related to it by connexion, we are prepared to commence our study of to day with an examination of the more minute anatomy of those various crypts and follicles which stud the mucous lining of this tube, and enquire briefly with regard to some of their functions and particular situations, - and notice the villi which are found so generally spread over the surface. It may be stated with regard to these follicles that in a general manner, their function is that of secreting mucous by which the parts are sheathed and kept constantly lubricated, and without which a continued constipation would exist, Their number in the whole extent of the tract are immense, - almost beyond approximation, although they are generally computed at about fifty millions, The first class of these follicles to which we must give attention are those mucous crypts or follicles of Lieberkuhn as they have been called from the anatomist who first described them. These are the most minute of those found in the alimentary Canal, although in diseased conditions of the mucous surface they become obvious to the naked eye, When this is the case they present the appearance of occupying the greater portion of the surface - that is, the diameters of the openings are greater than the distances between them. The appearance which they present under a glass of high magnifying power is represented in this large drawing where they have been carefully depicted, - the black spots representing the mouths by which they open upon the surface of the membrane, They are formed by indentations as it were of the mucous lining in to the fibrous coat forming little blind pouches or cul de sac from which the mucous is thrown, - thus when pressure is made upon a mucous surface the fluid is expressed from these Cavities. Many points which are exceedingly minute in the human body are found more coarsely expressed in the varieties of the animal kingdom, and of this we often take advantage in the formation of our ideas of the more minute structures In the sturgeon for example, - a piece of the intestine of which I here hold up, - we have as it were a magnified representation of these follicles of Lieberkuhn as they appear in the human

intestine, exhibiting very well the characteristics of the membrane. These follicles are found first in the pharynx and oesophagus, - or at least some of a similar nature, where they are mixed up particularly at the lower portion of the tube with some additional mucous gland, - oesophageal glands as they are called, These are however, only compound follicles, or consist of a number aggregated together and throwing their secretions into a common duct, instead of each having an opening upon the surface, In some animals these secrete a kind of milky fluid, and in birds particularly this is the case, - becoming mixed up in the craw with the other aliments, It is this fluid which has given rise to the idea of "pigeons milk" which we some times hear of. In the stomach we have a great many of these mucous follicles situated all through the membrane which is arranged into a kind of honey comb appearance, in the depressions of which we have these follicular crypts arranged like the papillae of the skin, These are not however the proper follicles of Lieberkuhn, having an altogether different function as well as a variation in form from the others, It is to these that the secretion of the gastric fluid so necessary in digestion is supposed to be due, They like the others are lined by the mucous membrane to which an immense amount of blood vessels are distributed from which to accomplish the secretion, When we pass on into the duodenum, where the lining membrane is more liable to irritation from the passage of the bile as well as the chymified food, - we find these follicles increased in number in the this necessity for a greater amount of sheathing to the parts Here we find the whole membrane so thick with them as to have been compared to the pancreas when cut into. They are here collected somewhat as in the oesophagus, - many opening all around into one excretory duct which empties itself upon the surface, thus giving much more room for the accumulation of numbers, These and these alone are the proper Glands of Brunner, being found only in the duodenum and in some instances in the jejunum, They look when magnified somewhat like the salivary glands and their secretion has very much the character of saliva, In the whole tract of the small intestine we find numbers of these follicles of Lieberkuhn and beside them some others which are now to be noticed, Principally at the lower end of the ileum, but some

times also in the colon and jejunum, and even as high as the duodenum we meet with what have been termed the glandulæ agminatæ or glands of Peyer, which have played such an important role in the pathology of modern times, being formerly believed to be the seat of the local exciting cause of typhoid fever, but more recently considered as a consequence of rather than the cause of this affection, as they are found to be in a diseased condition in almost all cases of low fever. When these are exposed to the microscope, they are found to be surrounded by the folicles of Lieberkuhn, Their situation is generally in the neighbourhood of the ileo cœcal valve upon the part of the ileum opposite to the mesentary, and this situation accounts for the tenderness which is experienced to a greater degree in the right iliac fossa during the affections in which these are diseased. The are represented upon this enlarged drawing, and are seen to be a collection of follicular looking bodies which are supposed to have orifices opening into the intestine although they cannot be demonstrated. The whole surface of these patches are studded over with the common villi of the intestine in the same manner as the other parts. Another and the only remaining class of follicular structures are the glandulæ solitariæ as they are called from their separate situation in the membrane. confounded by some authors with the glands of Brunner, or rather called follicles of Brunner, These are found especially diseased in Colitis and dysentary, being enlarged and otherwise depraved. They consist of simple follicles formed as represented on the drawing, and are scattered over the entire membrane having for their function that of those heretofore considered. We now come to a consideration of the villi which we have already noticed as covering the entire surface of the small intestine. These were formerly considered to exist only in the stomach and upper part of the small intestine but it is now very doubtful whether any exist in the stomach at all, as those which were heretofore supposed to be villi, are now thought to be a kind of papillary tissue such as is found on some parts of the skin. In the small intestine they are very abundant covering the entire surface like the pile upon velvet to which they are properly comparable. In a portion of the small intestine of an ox which I exhibit to you, we have a

times also

magnified representation of what is found in man, the villi being here about one fourth of an inch in length whilst in the human intestine they are not more than the one thirtieth of an inch long. You see the immense number and forms which they assume, and this very well indicates their character as met with in the human subject. In the large diagram upon the Black Board you have a representation of one of these villi after death, highly magnified. This is as observed by Krause of Hanover and exhibits the origin of the lacteals which transfer the Chyle through the mesenteric glands into the thoracic duct. It will be seen that these do not appear to communicate directly with the interior of the bowel, and all the injections of the very finest character made by Schwann and others have never passed out through the villus. It is therefore probable that the Chyle passes by a kind of imbibition through the walls of the villus and thus gets into the lacteal at its commencement. These villi are most abundantly supplied with blood as will be seen by the enlarged drawing of the arteries which have been injected, and also by inspecting the preparation in the jar in which the arteries are minutely injected, giving the whole a red colour. The veins however are in much greater number than the arteries, indeed so numerous are they as to cover entirely the arteries and hide them from view when freely and carefully injected. Thus they are as it were, made up of a complete net work of blood vessels and absorbents. In the villi of the different situations along the alimentary tract, the blood vessels have a different mode of terminating, but this great degree of nicety I shall not now occupy your time in considering, as time is now very precious. Upon the surface or in the coats of the large intestine we sometimes have small pouches formed into which you may pass a little finger, - forcing out the outer coats and hanging as it were from the bowel as appendages. These when met with have by some been supposed to consist in a dilatation or enlargement of the follicles to an enormous size, but this is by no means the case and I bring this preparation before you and speak of it for the purpose of guarding you against the error which is fallen into by so many, when there are not

with. They are mere cysts formed out of the mucous as well as the other coats of the intestine, and are never seen except in cases where there has been excessive constipation for a long period prior to dissolution. They are in fact produced by the accumulation of hardened faeces press-ing against the side of the bowel for a long time and thus making an indentation in which to lodge and to obstruct other portions of the faecal matter. I here ex-hibit to you a beautiful preparation of Peyers glands as they are seen in the thickened and enlarged condition of some fevers, near to the termination of the ileum.
I shall now proceed to demonstrate briefly, the arteries which are distributed to the lower portion of the alim-entary canal, and as you are aware of the relative situations of the aorta and surrounding structures, those now to be considered will be seen to better advantage upon the large plates of Tiedeman where the parts are arranged so as to exhibit a clearer view than could be had from the subject. We have seen the aorta where it pierces the diaphragm to get into the abdomen, and have also seen where it divides into the two great iliacs below, - and we have next to examine the intervening parts. The first vessels given off are two immediately on the lower surface of the diaphragm to which they are distr-ibuted, and called the Phrenics. Just below these we have the Coeliac or tripod of Haller so called from its three great branches, the distribution of which we have already noticed, and shall now only revert to in order to observe the anastomoses which is formed between the right and left gastro epiploic branches at the greater curvature of the stomach, by which branches are sent off in numbers to the great omentum which is thus rend-ered so vascular that in becoming strangulated in a hern-ial protrusion it quickly inflames and sloughs. Next below the Coeliac we have the superior mesenteric, a large trunk which forms an arch over to the left side in the mesentery. This arch being only seven inches in length, and having to supply an intestine more than twenty feet long, must of course branch out in some manner by which to accomplish this purpose. This is effected by means of three successive sets of arches by which the branches are increased and

spread out in a geometrical ratio. This artery supplies the right and transverse portion of the large intestine as well as the small. It divides into three branches one which supplies the ileum and lower part of the colon, called the ileo colic branch,—another to the ascending right colon, called the colica dextra,—and another to the transverse colon called the colica media. Between each of these there are large anastomoses, or arches which join them together in the continuous supplying of the parts. The remaining left or descending portion of the colon as well as the sigmoid flexure are supplied through the agency of the inferior mesenteric artery. This is also divided into three branches. The first or colica sinistra superior supplies the upper portion of the left colon and anastomoses by the largest connexion in the body, with the colica media before mentioned. These anastomoses which in other parts where we have met with them, have been by capillaries or small vessels, are here by large trunks containing vast amounts of blood, and hence it is that in violent congestive inflammations of these parts such as were met with in Cholera, they abstracted so much blood from the circulation as not to leave enough to carry on the functions of the body. The next branch or colica sinistra inferior is distributed to the lower portion and sigmoid flexure of the colon and also anastomoses with the last. The third and last branch is the superior hemorrhoidal which dips down into the pelvis, some of the branches being traced as far as the anus. It supplies the rectum principally. Just above this inferior mesenteric artery we have given off two arteries which in man go to the testes, and in woman to the ovaries. These are called the spermatic arteries,—and are well shown in this plate of Tiedemann of the uterus at the sixth month when they are very large from the necessity for blood in the parts during utero gestation. In the male these arteries are very long, and pass out as one of the constituents of the cord, through the abdominal ring to be distributed to the testicle, in order for the secretion of the spermatic liquor or semen. The lumbar arteries are also given off in this region are of small size and distributed to the muscles

&c in the neighbourhood of their origin. Beside these there are no arteries given off in the abdominal cavity from the aorta with the exception of the two emulgents or renal arteries one to each kidney. We have next to enter upon the consideration of the urinary apparatus to which these arteries supply their blood, and first of these to the secreting gland or kidney; These are glandular organs, two in number, situated on either side of the spinal column in the lumbar region, inside of the heads of the short ribs. They are not always situated on the same level, the right one being very frequently somewhat lower down in consequence of the extension of the right lobe of the liver lower than at other instances. These kidneys are of a flattened oval shape with one side of the oval indented, very much like that of the large kidney bean with which you are all familiar. They are usually about three inches and a half in length by two and a half in breadth. The indentation in the inside where the vessels enter and leave the organ is called the Hylus Renalis. Surmounting the kidney and attached to it by the cellular tissue of which it is in part composed, we have an anomalous body which will require from us a few moments consideration. This is called the supra renal capsule. This in the adult is generally little more than a mass of cellular tissue although in this instance it is quite large, say nearly one half as large as the kidney itself. The use of this substance is wholly unknown, probably however something to do with foetal life, as it is then in its greatest state of development being before the third month equal in size to the kidney. That it is of much importance is very evident from the great supply of blood and nerves which it receives, although in many cases it is scarcely to be detected in the mass of cellular substance into which it appears to have been transformed. Its ordinary shape is that of a flattened helmet or cocked hat, the upper part of which is generally attached to the liver above. It does not appear at any time to be associated in function with the kidney, for in those cases where the kidneys have been found misplaced, this body retained its ordinary position in contact with the liver and detached from

the kidney. When laid open we do not find it to possess at all the characters of a gland but to consist of a dark brown mass, which when open presents a cavity lined apparently by a false membrane, some conceive this to be a true membrane and the dark coagula found so often within it to be an effusion from it, whilst others think the cavity when it exists to be formed by the effusion from a large venous trunk which is always found in its centre, and the membrane to be the effect of this effusion, This rupture of the vein is believed by Crui-ckshank to be the cause of all these appearances. as the vein is very constantly found occupying this seat in the part. Passing into the kidney through this hylus renalis we have various vessels, the largest of which is this, which is the excretory duct of the gland and called the ureter This is the passage between the kidney and the urinary bladder which is the receptacle in which the secretion is placed until the collection makes it necessary to expel it through the organs. These ureters are from fourt-een to sixteen inches in length and when distended with air almost the size of ones little finger, The large renal artery which comes off at right angles from the aorta, also enters the organ through this fissure, as well as the still larger renal vein which empties itself into the vena cava which runs up the abdominal cavity between the two organs, When the arteries and veins of the kidney are filled with different coloured injections and then the soft parts corroded away by decomposition, the hard-ened matter is left, and presents the appearance of a mass of vessels retaining to a great degree the form of the organ, so numerous and intricate are they in their branchings.

**Lect. LXV.**

At our last meeting Gentlemen, we commenced the consid-eration of the urinary organs, with that of the laboratory in which it is formed, namely the kidney. Above this we noticed the existence of a body known as the supra renal capsule which we could not regard as a gland, — neither as having any association with the kidney, except the mere conjunction of the two bodies, — neither could we determine for this body any function in the economy, but rather supposing it to be connected with foetal life. — We examined into the situation and form of the kidneys, — noticed the short arteries and veins which entered and left them, as well as the long tube or duct leading from it down to the bladder called the ureter. This excretory duct is of fibrous conformation and lined in common with the urinary passages in general, with an entirely distinct mucous membrane from that which we have considered in the alimentary canal. When we open this tube and trace it into the kidney, we find it there expanding into a kind of trumpet shaped cavity which is denominated the pelvis of the kidney, from its being the basin or receptacle into which the whole secretion of the organ is poured. This pelvis has opening into it three other sacks which are somewhat funnel shaped, having an expanded portion, and a contracted orifice communicating with the pelvis. These are called the infundibula, — each of which at its expanded portion are again divided into three cup like cavities into each of which projects one of the papillae of the kidney. These cups are called the calices of the kidney and receive the secretion in the first instance conveying it into the infundibula. As we open the organ further we find the papilla or nipple shaped body projecting into this calyx is the apex of a conoidal body, the base of which is directed to the exterior of the kidney. These are the conoidal bodies of Malpighi as they are called, — being formed each of a number of tubules, each body conoidal in shape with the apex towards the calyx. These vary in number, being usually from 15 to 18 in each conoid body — they are and are called the lesser conoid bodies smaller pyramids of Ferrein, each opening on the nipple shaped projection by a single small orifice. Upon the exterior of these cones of Malpighi we find a different kind of substance surrounding the whole organ and dipping in between the bases of the cones. This is called the cortical portion of the kidney, and makes the organ to consist of two distinct structures a tubular, and a cortical.

As we open the whole organ, the arrangement of the parts becomes manifest, - we see the pelvis dividing into the inf-undibula, these sub-dividing into the Calices, - and each of them receiving the papilla or apex of the Cone constituted of the uriniferous tubes. These papilla very much resemble the nipple of the female mamma, having like it about the ~~same~~ number, from fifteen to twenty, little orifices through wh-ich the secretion is discharged. When we lay open one of these Conoid bodies of Malpighi, we find it arranged in lines, very much like muscular fibres, - but a closer examination with a magnifying power shows these apparent fibres to be little tubes and called the uriniferous ducts. The bases of these Conoid bodies are rounded and lie near but not in contact with each other allowing the yellow-ish Cortical substance to dip down between them. This Cortical portion is much more vascular than the tubular, having the renal artery ramifying almost exclusive in its sub-stance. A branch of the artery and vein run up to the peri-phery of the organ between each of these Conoidal bodies by which each is supplied by a circulation perfectly distinct and separate from all the rest, - although the branches to these tubular portions are very few. Upon this large dia-gram you will be able to see the different parts more clearly than in the kidney itself where they are so small as to be only clearly appreciated when closely examined which may be done by any of you after the lecture. Here you see represented the pelvis, the calices and the Conoidal bodies, - the latter made up of a number of small uriniferous ducts. These you see, from the base of the Conoidal bodies are straight, to their terminating in the papilla, and are called the ducts of Bellini whilst their extensions into the Cortical portion beyond the base of the Cone, where they become convoluted in the Cortical part, are called the tubes of Ferrein. Here they generally terminate in blind pouches, although some of them communicate with each other by a kind of anas-tomoses. Between these tubes of Ferrein you notice a num-ber of small granular bodies situated, these are called the Corpuscles of Malpighi or the glomerules, being a kind of appendages to these tubes of Ferrein, each having an arterial branch distributed to it, and a small duct communicating from it, with these convoluted tubes of Ferrein.

15 cones

Each of these ~~cones~~ pyramids of Ferrein again are said
Pyramids of Ferrein
to be composed of seven hundred smaller tubules, making the whole number in one kidney to exceed 10.000. It has even been said by some, that each of these most minute pyramids is compounded of some twenty still smaller, but the observation has not been confirmed, and is regarded as quite equivocal. From the bloodvessels distributed in the cortical portion then the urine appears to be secreted into these tubes, and then to be conveyed down them to the papillary apex of the cone, from whence it distils into the calices, and thence down the ureters which as before mentioned are from 14 to 18 inches in length, – directly into the cavity of the urinary bladder. These ureters en-ter the coats of the bladder in a very oblique direction, there being about three fourths of an inch between the perforation of the external coat and the opening upon the internal one This obliquity effectually prevents any return of the fluid after once having been poured into the bladder, – for the more the organ becomes distended, the more firmly are the walls of the passage pressed together, by the contained fluid – hence the impossibility of any regurgitation. The urine is poured into the bladder through these orifices drop by drop as I have had an opportunity of observing in a case where the whole anterior portion of the bladder was deficient – and in such a manner as to perfectly convince me that the ureters if not muscular, are at least highly contractile for the regular manner in which the large globules were forced in, with the positive vermicular motion of the duct left no room for doubt. The bladder may be blown up through these ureters which will retain the air without any difficulty without the necessity of a ligature. The orifice of each side is marked by the probes introduced as well as the oblique direction of the canal, and the point at which the ends of the probe meet, marks the neck of the bladder, – and thus we have marked out what is called the vesical triangle, or trigone vesicale which is as its name imports a proper equilateral triangle and distinguished from the rest of the internal surface of the organ by being covered with villi, the remainder of the mucous membrane having none visible upon it. The walls are somewhat thicker in this portion

too thin dissection. The shape of the bladder, which we now have to consider, is various under various circumstances, - as well as in different individuals. - When removed from the body and distended by air, you see it is of a somewhat oval shape; but distended with urine in the cavity of the abdomen it generally acquires something of a triangular shape with the apex upward, - from being flattened by the rectum behind, and by the mass of small intestine on each side. When these are empty however it will assume more nearly the shape which you see. It is situated in the cavity of the abdomen and pelvis behind and above the symphyses pubis, - and for the sake of description is divided into four parts, an upper fundus a body, a lower fundus or bas fond, and a neck. The lower part or bas fond, is that part most liable to vary in shape and extent, forming at times a kind of cul de sac in which stones are generally found. Just below this ~~are~~ the back portion we find the prostate gland, attached to the urethra however, and not to the bladder. The outer coat of the bladder is formed by peritoneum. This is however incomplete as the membrane is reflected off from the abdominal parietes so as to reach the organ only at the fundus over which it passes, dipping down behind between it and the rectum so as to cover this portion completely, - the cul de sac thus formed reaching to within ¾ of an inch of the prostate gland, and about 3½ inches of the orifice of the rectum. Next to the peritoneal, we have in common with all the other hollow viscera, a muscular coat. This is composed of two sets of fibres, the outer longitudinal, - the inner circular. The longitudinal fibres run over the fundus and are inserted before into the anterior ligaments of the bladder as they are called, being only a reflection of the superior perineal fascia by which the organ is attached to the pubis. The posterior fibres are collected into a strong band, and inserted into the prostate and through it into the membranous portion of the urethra. Now this prostate gland being firmly fixed between the two layers of the triangular or middle perineal fascia, you see the fibres have a perfectly stable point from which to act in their contractions. From these reasons it is to ~~the~~ these set of fibres that the name of detrusor urinæ

muscle has been given by authors in their descriptions. Below this layer and in connexion with it we have the layer of circular fibres, these are by no means regular in their course, surrounding all parts of the organ, but without observing any fixed direction, being however thicker and more regular as you approach the neck. Next within this you have a dense cellular layer which unites the muscular to the mucous coats, - and which is the effective agent in resisting any tendency to exudation of the contained fluid, as the other coats are quite permeable. The mucous membrane which lines this organ is of an exceedingly delicate character, being destitute of folds with the exception of the triangle before mentioned, - but completely studded by mucous follicles, which are so very minute as only to become visible when the organ is affected with a catarrh. The arrangement at the neck of the bladder by which it is closed, has been supposed to be formed wholly by a congregation of the circular muscular fibres arranged in the form of a complete sphincter, but this I am convinced is a mistake, the more simple and correct way of viewing it being to suppose a gradual change taking place in the majority of these fibres as they approach the neck, being converted into that yellow elastic ligament which we have noticed in some portions of the body, - so that at the neck these elastic fibres are collected into a band which surrounds the neck of the organ, and keeps it closed. This is like a ring of india rubber placed around the orifice into which you may see the longitudinal fibres inserted by little tendons. That there are some muscular fibres in this structure is very evident from the spasmodic stricture which occasionally occurs at this point, but the greater part are simply elastic. This contractile arrangement is overcome in all cases by the antagonist force of the muscular fibres of the organ contracting upon its contents thus dilating and keeping dilated this ring whilst the contents are passing out under the pressure thus exerted upon them. As we pass on down below this neck we observe the prostate gland situated principally upon the back portion of the commencing urethra. This gland you see is somewhat of the shape of a

See what the Physiologists say in this respect
— In Palsy of the bladder, the Sphincter is weakened so that there is incontinence of urine —
- In Palsy of the bowels, there is constipation - ?

horse chestnut, being about or a little more than one inch in length, whilst in breadth it measures an inch and a quarter, and is
3/4
half an inch thick. It surrounds this upper part of the urethra, and its particular portion called prostatic we have before noticed.
The urethra which is the terminal passage of the urine and extends as a canal, from the neck of the bladder to the end of the penis, – is in the case before us at least twelve inches in length, but this is somewhat unusual because it is overstretched, as the more common length is about nine inches. The upper or prostatic portion of the urethra is about 1¼ inches in length and is fixed by the prostate's surrounding it so closely. – The membranous portion which is next to this is also fixed being situated between the two layers of the middle fascia of the perineum, It is about ¾ of an inch upon its under surface whilst the upper under in consequence of the ~~curve~~ projection of the bulb is not more than half an inch in length to the triangular ligament which it pierces. The remaining portion of the urethra from this triangular ligament to the end of the glans has appended to it, what is called the corpus spongiosum ~~penis~~ urethrae, which we shall shortly have to notice. The upper portions of the urethra being as we have seen fixed by their attachments to immovable parts, and being in a naturally curved condition which the whole canal has when in an erect position, – are not capable of being rendered straight by any manipulation on the part of the surgeon, but by relaxing the suspensory ligaments of the penis, and by exercising a slight degree of traction on the penis it may be rendered so near straight as to admit of straight instruments being passed into the bladder when this is desirable. When the parts are in the ordinary condition with the penis hanging down there are two curves in different directions forming something like the shape of the letter S. but as we raise the penis and relax the muscles of the abdomen and the pubic ligaments of the organ, the passage is rendered very easy. We notice here that this spongy portion of the urethra terminates in the glans penis which in fact is the enlarged extremity of this portion, being continuous in tissue as is shown by the injection passing from this portion and filling the glans at the same time. These glans have no communication with the body of the penis or corpus cavernosum, as is shown by

the facility with which they are dissected apart, the former
merely lying as a capital upon a column, the union is by cellular tissue, a few small vessels passing between. - the capital
being excavated for the reception of the somewhat pointed
extremity of the column. There are only a very small number
of vessels which pass between these two structures the principal
union being by cellular tissue. This corpus cavernosum penis
arises by two roots as we have seen, one from each ramus
of the ischium and pubis, being covered here by the erec-
tores penis muscles. Between these crura of the penis we
see the bulb of the urethra lies. This origin and formation
by crura, from the bones, is perfectly analogous with that
of the female clitoris, which however has no urethra or corpus
spongiosum. When we make a dissection of this corpus caver-
-nosum, we cut first the skin, then the superficial fascia then a deeper fascia continuous with the lower true fascia of the Perineum
and then come to a dense fibrous and very elastic tissue
which surrounds the cavernous portion and is called the
involucrum of the penis. This is here laid open to give you
an idea of its thickness and strength. From the anterior to
the posterior part of the cavernous portion there is a partit-
-ion of this fibrous tissue, dividing the whole into two parts
as was formerly supposed and described. This description
as two symmetrical portions is now abandoned, as the anterior
portion of the septum is imperfect and does not form a par-
tition, the fibres being arranged with interstices and thus com-
pared to the teeth of a comb and called the pectiniform
septum. - Beside this extensive partition there are others lea-
-ving the internal surface of the involucrum and dividing
the whole cavity into a great number of cells, like those of
an orange. Over the surfaces of these septa are spread
the blood vessels of the organ each set communicating with
little globular cavities situated in these cells. These
veins communicate with the large ones on the surface of
the involucrum and the two from either side meet below
and behind the symphysis pubis to form the great ves-
-ical plexus with others from the surrounding parts.
This involucrum forms a hollow groove on the lower
surface of the corpus cavernosum in which is lodged
the corpus spongiosum surrounded by the same kind
of an involucrum, and arranged in a similar manner
fastened to the sides of the corpus cavernosum. The cells
of each of these structures are equally liable to erection
as they are arranged exactly similarly. The fibres of which

this involucrum is composed, whether they be muscular or not are at least eminently contractile, being as you see in this specimen taken from the horse most evidently muscular in their arrangement, Along this urethral passage we have a number of ducts emptying themselves, which must now receive some attention In the first place we have the excretory ducts of the testicles the vasa deferentia descending along the back of the bladder, receiving the ducts of the vesiculæ seminales and perforating the prostate gland to empty themselves into the urethra just below it. These, one on each side divide the prostate into 3 lobes two lateral and one middle or lobe of Home, which projects into the neck of the bladder and forms (in disease a projection about the place of) the uvula vesicæ, A small erectile eminence which exists between the openings of the ducts of the vasa deferentia is called Caput gallinaginis, Above this we see a number of little openings in the membrane into which bristles are passed, - these are the orifices of the ducts of the prostate gland which are from 12 to 15 in number and throw out a simple mucous which this gland secretes, to lubricate the parts. Below these and near the triangular ligament we have the orifices of the ducts of Cowpers glands, these ducts being as you see about an inch in length, and emptying in the advance of the bulb, Beside these there are in the remainder of the tract about 60 little lacunæ which throw out mucous, - some of which sometimes become so much enlarged as to obstruct the passage of the catheter by catching the end of it. The vesiculæ seminales are situated on the back portion of the bladder near the passage of the vas deferens, and are connected together, They are about two inches in length, but when examined more carefully are found to be a convoluted tube of from six to eight inches long, - they are merely receptacles for the vas deferens but secrete a peculiar drab colored fluid of their own, the ducts unite with the vas deferens and form the ductus ejaculatorius which has been noticed. The bladder receives its blood from a branch from each internal iliac, coming off as you see below the middle hemorrhoidal which has here been cut off. The Penis gets its supply of arterial blood from the internal pudic artery a branch from which runs out on either side of the organ, - and the nerves which you see are exceedingly numerous come from the sacral plexus making it as you perceive, a very nervous organ.

Lect. LXVI.

I propose at first to beg to draw your attention briefly to the structure and coverings of the testicle. The situation of these glands, one upon each side, you are all familiar with, being appended to the penis by means of a bag called the scrotum. This scrotum which is the outer covering of the organ, is a mere doubling of the skin, which is made thus as it were too large, in its passage from the pubes back to the perineum. This bag or pouch is separated into two compartments upon the median line, one for each organ which partition is marked externally by the raphe or seam, which is common to all the median parts of the body. This external covering generally presents a more or less corrugated appearance, and has scattering hairs growing over it. When we turn down this outer envelope, we come next to a layer of cellular tissue of a peculiar character which constitutes what is known as the Dartos muscle, or muscle of the scrotum. This has acquired its denomination of muscle from its somewhat fibrous nature and from its red colour - but under the glass it loses much of this fibrous arrangement and all the acknowledged attributes of muscular tissue and appears to consist of a modified cellular tissue, modified to that peculiar contractile tissue which we have had occasion to notice in some other parts of the body. This degree of contraction appears to be entirely necessary here where little force is needed, - and where contraction only takes place under particular circumstances. Thus when exposed to cold this contraction occurs corrugating the skin, in order to keep the glands drawn closely up to the body and thus maintain a temperature which will not interfere with the action of the organs. The Dartos of either side, upon reaching the middle line of the scrotum is reflected back to the posterior part so as to give two layers to the septum between the two sides. This is evident now as I dissect them up from this septum scroti as it is called. This fact is important to be remembered in some cases of oedema of the scrotum in which a puncture becomes necessary as will sometimes happen, - for in such instances you are enabled by this arrangement to make an incision without the risk of wounding the cavity in which the testicle is lodged, which would be liable to produce inflammation. If this Dartos be described as a separate muscle it is said to arise from the ramus

of the pubis and ischium and after passing over to the raphé is reflected back to have its insertion into the Corpus Spongiosum of the urethra upon its lower middle line. This Constitutes the second covering to the organ, next to which we Come to a coat which is decidedly of a muscular Character when at all developed. Of this we have before spoken as the tunica vaginalis Communis, and as being made up of the infundibular fascia, Cremaster muscle, and intercol-umnar fascia fused into one covering. From its muscular Character it has also been called tunica elythroides; It takes its origin from the parts of the inguinal canal which have been noticed, - the muscle coming from the tendon of the internal oblique and transversalis principally. This appears to be of use in supporting the organ in a proper position, and is sometimes capable of contracting voluntarily. It is also known to contract at times in diseases of the kidney from some irritation which is sympathetically convey-ed to it. Below this we have another pouch which as you see by this specimen, can be inflated with air, so as to exhibit its form and size. This is a serous membrane and lines the internal face of the Cremaster muscle as it surround the organ. Another portion of the same serous membrane covers the organ closely so that the two serous surfaces are in contact; these are together described as the tunica vaginalis testis [illegible] and reflexa, - the first being that which covers the gland, and the latter that which lines the muscle. These terms have been subject to some confusion by the writers who have made use of them. There is, as in serous cavities generally always found a small quantity of fluid here, - which by under the effects of disease, may increase to a quantity varying from a few ounces to two pints. This accumulation constitutes hydrocele or dropsy of the testicle. The fifth and last coat of the testicle is as you see a dense white inelastic fibrous tissue a capsule which immediately surrounds the gland, and from its colour is called the tunica albuginea. This in its character as well as its function has much analogy with the sclerotic coat of the eye. However closely this must hold the testicle under ordinary circumstances, it is still liable to become somewhat distended in inflammation of the organ as hernia humoralis which arises from the inflammation of the urethra travelling

down the vas deferens. And it is this unyielding nature which renders the affection so painful. It is also liable to become thickened as in the case before us when this has been caused by the radical cure of an hydrocele, in which the last tunic mentioned is in some cases though rarely incorporated with it by the adhesive inflammation produced. We next come to take a view of the structure of the organ, and as we turn off this tunica albuginea, we bring into view a number of small lobes or lobules into which the whole gland is divided, there existing here 300 of these little bodies. all somewhat conoid with their bases directed to the anterior portion of the organ. These fill up the whole cavity of the tunica albuginea and are immediately surrounded by a very delicate vascular layer resembling the pia mater of the brain, in which the vessels ramify and divide before entering the lobules. From the inner surface of the tunica albuginea there dips in a great number of partitions which are called interlobular septa, and serve to support these lobules in their places. When we come to examine these lobules more closely, we find them to consist of convolutions or doublings of a very minute tube, which is fine the finest thread being not more than the 200th of an inch in diameter. These are the seminiferous ducts, and are said by Monro to measure in each lobule 17½ feet but this is probably an exaggeration as has been said by some later observers. These very minute structures it is impossible to show to advantage in the preparation, and we therefore have recourse to enlarged drawings, the first of which represents a section from before backwards through the middle of the gland. You here have represented the septa and also starting out from these, other smaller ones called the septula dividing the whole into a number of cells for the lodgment of these various lobules. These septa run together and accumulate in a body at the posterior part of the organ constituting what is called the Corpus Highmorianum. Another drawing you have here representing a transverse section of the organ exhibiting a different view of the cells, and showing the vascularity of this pia mater like membrane. The whole of the gland may be injected from the vas deferens, as you see has been done in this case by mercury, forming one of the most complete and beautiful prepa-

-rateous extant. although it has suffered somewhat from accidents. This however will by no means serve for class demonstration, and I have therefore a diagram placed upon the black board, representing a section of the organ in which eight of these lobules are shown. They terminate as you see at their apices, in straight tubes which are called the vasa recta. these anastomose freely and frequently with each other and form a net work like a plexus of veins. This is called the rete testis and extends from the bottom to the top at the back part of the organ, where it terminates in from 12 to 18 ducts called the vasa efferentia, these again unite and anastomose, dividing into a great number of small ducts constituting the Coni vasculosi, These Coni vasculosi ~~form a very large and long~~ plexus reaching in the form of a prismatic arch from the top of the testicle to the bottom at the back part of the organ, The whole of this constitutes the epididymus, so called from some resemblance between its two ends, giving it the appearance of twins, The upper end being the largest where it turns over is called the globus major whilst the lower where it again turns upward is the globus minor. From this globus minor the whole ducts are condensed into one which is the vas deferens which ascends at the back of the testicle along the cord to pierce the prostate gland and empty into the urethra as we have before seen, From this vas deferens just after its formation from the epididymus, there runs out a small branch as it were, which generally terminates in a blind extremity. this is called vasculum aberrens, the use of which is not known, These are all exceedingly vascular structures as may be seen by the minute mercurial and other injections upon the table. being supplied profusely with blood from the spermatic Arteries, as well as a branch from the ~~umbilical~~ which comes down making a part of the constituents of the spermatic cord. These form as you see, a vascular arch over the epididymus, from which branches run out to all the lobules and other parts. From this free supply of arterial blood all the spermatic secretion is formed, this being accomplished in the little tubes or ducts before spoken of, the collective lengths of which Monroe has asserted to be something over one mile

wrong

vesical

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in each testicle. This however according to later observers is much beyond the true length, it not exceeding one half of this. Now the mucous membrane lining the urethra is continued and subdivided so as to line all these passages, and hence the facility with which inflammation is transmitted in the production of hernia humoralis. The veins surrounding these structures are exceedingly numerous and large as may be seen by the injected preparation where these alone are injected being without valves. This plexus constitutes what has been called the Corpus Pampiniforme, and a varicose condition which often occurs in them makes the surgical affection known as cirsocele or varicocele. The testicle is not formed in the scrotum, but is found up in the abdomen in the foetus in utero only descending through the abdominal ring about the period of birth. At the period of birth the cavity of the abdomen and that of the scrotum are continuous through this ring, which after the decent of the organ is closed up by a species of adhesive inflammation. The decent of the testicle is accomplished by means of a fibrous band called the Gubernaculum testis, which being attached to the end of the testicle and the scrotum, produces the effect by its contraction, becoming shortened to about ¼ of an inch in the specimen which I hold in my hand. We next come to take up for consideration the Structure of the Eye and its appendages. The orbicularis palpebra muscle which we have here dissected out, we have already considered when we found it to be a circular sphincter by which the lids are closed the two points of action being the outer and inner canthus. The fissure thus produced, varies very much in its size in different individuals thus giving rise to the apparent difference in the size of the eye, the ball in all cases being very nearly the same. This difference in extreme cases amounts to as much as one fifth of the whole length. We notice above the orbit of the eye a thick row of hair called the supercilia, placed there for the purpose of preventing the sweat from running down into the eye from the forehead. Upon the edges of the tarsal cartilages we also have three or four rows of hairs called eye lashes. just within which again there are a great number of little orifices arranged in a row which are the excretory openings of the glands of meibomius. These are some 30 or 40 in number and are of a size to

admit a bristle as you may see. Their function is to pour out a fluid of an oily nature which prevents the tears from passing over the lids, - When inflammed this discharge becomes purulent and causes that agglutination of the lids together, so common in sore eyes. Within the external angle of the os frontis in a depression which we have noticed there, we find lodged a small glandular body about the size and shape of a shelled almond, which throws its secretion out upon the ball of the eye by a number of little ducts which generally open upon the upper lid near the outer canthus. These ducts of the Lachrymal gland are showed here by the insertion into them of bristles, which this eye taken from a calf will admit. This is placed here to secrete the tears or fluid by which the eye is kept lubricated. This fluid after having accomplished its purpose passes across to the inner Canthus where it is collected and carried off by a means now to be described. Upon each side of the Canthus one above the other below, we find two very small apertures whose orifices are turned towards the surface of the eye ball, these are called the puncta lachrymalia. When traced farther they are found to communicate each with a small duct or canal, the upper of which running inwards and downward, is met by the other running inward and upward so that the two in uniting form an angle. These are called the lachrymal canals and empty, at their junction into a kind of receptacle called the lachrymal sack. At the junction of the two canals there is a little fold of the mucous lining membrane which it is important to notice as by becoming inflamed it sometimes arrests the passage of a probe or syringe point, when it becomes desirable to use them. From this lachrymal sac we have the commencement of the Ductus ad nasi as it is called communicating with the cavity of the nose. Thus then the tears formed out by the lachrymal gland, pass over the eye enter the puncta pass into the sack and thence into the nostril. These parts may all be seen to much greater advantage when this enlarged drawing where they are all represented. The eye when removed from the orbit with all its appendages shows that these are confined in their places by the periostium of the orbit which comes away with them, - enclosing as you see the lachrymal gland and giving it a complete covering.

**Lect. LXVII.**

We were engaged yesterday gentlemen when the hour expired in the consideration of the eye lids, a part of the structure of which, together with the lachrymal gland ducts and sacks were then examined, and we then saw the route by which the secretion passed down into the inferior meatus of the nose. By the side of this lachrymal sack we have a very small muscle situated called the tensor tarsi muscle or sometimes the muscle of Horner. In this view of the sack, the small muscle is very well seen:- it arises from the bony ridge which I pointed out to you when speaking on the bones, leading to the mouth of the passage, and afterwards divides into two parts, one of which accompanies and is inserted into each of the little canals which lead out to the puncta. It would seem to be as here seen, a portion of the orbicularis muscle as it is closely associated with it, both in position and function. Its action appears to be that of keeping the inner canthus upon which the puncta are situated turned in, towards the ball of the eye in such a manner that the tears may readily pass into these little openings and be conducted into the sack, upon which the orbicularis muscle must exert some pressure which will tend to pass it on into the nostril. Connected with the structure of the lids we have also another muscle to consider, namely the Levator palpebra superior. This has its origin from the apex of the orbit above the foramen through which the optic nerve passes from whence it passes forwards as a long slender muscle, under the upper wall of the orbit until it arrives at the lid where it becomes spread out in a fan like shape forming a part of the structure of the lid into the margin of which it is inserted. The action of this muscle is that of opening the eye, after having been closed by the action of the orbicularis muscle, - its action only being exerted upon the upper lid. The lower lid has no arrangement of the kind, never being depressed except by the action of the ball in rolling downwards against it. This is a very small muscle as you see, and is sometimes congenitally paralyzed, whilst at others the same defect occurs during certain diseases of the eye. This defect in such cases may be remedied by a slight operation, in which a portion of the skin is removed, and the lid thus shortened and brought in contact with the occipito frontalis muscle which in this case acts as a substitute for the levator palpebra.

Now the action of this muscle if inserted into the margin of a loose and perfectly flexible lid would be almost nugatory, as it would produce so imperfect an effect. This arrangement is therefore perfected by the stretching across in the margin of both eye lids, an elastic arc which is of a firm cartilaginous consistence, which tends to keep the lid stretched out, These existing at the edge of the lids prevent them from being puckered up by the action of this and the orbicularis muscles, as they are in many animals as the common toad for instance when this tarsal cartilage as it is called is entirely wanting, They act precisely as do the stretchers which we put at the top and bottom of a linen map, by keeping it extended. These tarsal cartilages exist in both the upper and lower lids, but the upper is twice the size of the lower as you may see in this specimen when they are both dissected out. They neither of them extend quite to the canthus at either extremity of the same, but terminate internally very near to the puncta lachrymalia. On the free margin they are bevelled off at the expense of the inner or posterior edge in such a manner as to form little conduits as it were for the passage of the tears in their course across the ball to gain the lachrymal ducts. Just within this inner edge we observe a line of small openings, which are the orifices of the meibomian glands which were pointed out yesterday and which to day merit a somewhat more particular notice, We have here a very much enlarged representation of the meibomian follicles of a horse which are similar to those met with in the human subject, These we find to be not simple follicles or crypts such as we have before met with, but to consist of a long tube or cell from the sides of which spring out other compound cells for its entire length, like the leaflets from a long footstalk, These open as before mentioned and secrete an oily liquid which prevents the tears from overflowing, at the same time that it is somewhat soluble in the tears and washed away by them into the nostril, These are the secretions which are so troublesome in sore opthalmia, gluing up the lids and rendering them adherent. You will again notice the position of these orifices in a row in the edge of the cartilage. We next come to examine a membrane which lines the lids as well as covers the ball of the eye, called the conjunctiva, this we may

consider as commencing upon the lids at their free edges, and passing thence back all around, until they come in contact with the globe of the eye, which is as it were pushed into it from behind so as to form a pouch over the anterior part of the ball, and shutting out all communication with the posterior part of the orbit. The portions which cover the ball and line the lids have received different designations the one being called the palpebral the other the occular conjunctiva. This is a very delicate mucous lining studded all over with follicles so exceedingly minute as to require strong glasses to perceive them but which secrete a peculiar kind of mucous, which being mixed with the lachrymal secretion lubricates the surrounding parts and keeps them in a proper condition. At the inner canthus of the eye this conjunctival membrane is thrown into a fold called the plica semilunaris. The use of this mere doubling or fold in man does not appear obvious, and can only be accounted for as a rudiment of what we see in a number of animals and birds, as the third lid to the eye, - or a transparent thin membrane which can be passed over the organ at will, to protect it from violence. Thus in the duck for instance we find a complete example of such an arrangement, which is made use of in looking at the sun, or in diving for its prey. This when not in use is drawn up into the inner canthus of the eye, and resembles then somewhat the fold which we find here. Upon the outer side of this we have a small red body about the size of a grain of rice, which you are all doubtless familiar with in your own persons. This is the lachrymal caruncle so called, as it is seated between the puncta which we have before noticed. This little body is very red in health, but in debilitated and diseased individuals, presents a very pale aspect. It consists of numerous follicles collected together, which secrete a milky white fluid which is mixed with the other secretions of the organ. When we divide the conjunctiva and endeavour to strip it off from the lids and ball, we find that by a little maceration we are enabled to separate it as far as to the cornea where it resists our further efforts or tears off. This has induced some anatomists to suppose that it does not cover the cornea but ceases at its margin. This however is not the case, as by further maceration it comes with

facility from the whole surface of the cornea. This fact demonstrated with some little difficulty upon the human subject, is very easily proven upon the horse or other animals. The fact of its continuity over the cornea, if it were not thus proved, would be rendered incontestable by the effects of inflammation of the conjunctiva when the vessels become enlarged and convey red blood, in which case they pass entirely across the cornea as is seen by this large representation of pannus or vascular cornea. The vessels usually circulating in this membrane, although very numerous are not visible in a state of health, the portion covering the cornea particularly being in a state perfect transparency. We next come to the consideration of the ball of the eye with its various coats or tunics. First we notice that the ball is very nearly spherical in its shape, varying however, a little in its antero posterior diameter being about the 1/20 part of an inch longer than the transverse or vertical ones. This happens in consequence of the window which it has in the anterior portion projecting somewhat more than the other parts, as the transparent cornea is a segment of a smaller sphere than the other parts of the organ. What is generally spoken of as the outer coat of the eye consists in two coats or layers which pass over the posterior five sixths of the organ, the anterior sixth being occupied by the transparent cornea. This covering is of a firm hard consistence and hence called the sclerotic coat. This dense unyielding tunic is one of the best examples of a true fibrous membrane which we have seen, being very strong thick. This, at the posterior portion receives the optic nerve which does not pass directly in thru a single opening as might be supposed, but perforates the coat by a kind of cribriform plate, dividing into a great number of fibres. The neurilema or sheath of this nerve expands to form a part of this sclerotic coat, and hence as this membrane is placed around the nerve as it escapes from the cavity of the cranium, and resembles the dura mater in structure, the sclerotic coat is said by some anatomists to be an extension of the dura mater. It is thicker upon the back than on the front portions of the eye, where the ball is supported by the expansion of the tendons of the muscles which are here inserted. This expansion makes another coating around this portion of the eye and is known as the

tunica Albuginea extending for two or three lines behind the transparent cornea. Many doubt the existence of this as a proper tunic, as it is so closely connected with the sclerotic coat. The cornea is united to this sclerotic coat in a peculiar manner, in the same way that a watch glass is placed in the frame, - the sclerotic being bevelled off at the expense of its posterior edge, whilst the cornea is bevelled upon its anterior, Beside this interlocking or overlapping the two are united by an apparent continuity of structure so that the junction is strong enough to resist any force which can be applied for their separation, - a rupture of the scl-erotic itself taking place at its thinnest parts, namely under the tendons of the muscles, - rather than a separation at this junction. This cornea which appears to be entirely homo-geneous in structure at first sight, is nevertheless separable into a number of layers, say five or six, which after a little maceration may be felt slipping over each other when the cornea is rubbed between the finger and thumb, These layers are united together by light cellular tissue in the cells of which is secreted a very transparent fluid upon which much of the transparency of the cornea appears to de-pend, as after death when this exudes upon the surface the cornea becomes of a dull or opaque appearance, These layers are subject to ulceration which may commence in the centre and ulcerate outwards or inwards, - when the latter occurs it gives rise to the purulent effusion into the cavity and prod-uces the affection known as Hypopia, Below the conjunc-tiva we have a strong dense membrane which covers the ins-ertion of the muscles through which we have to cut in order to reach the tendons, This is called the tunica vaginalis oc-uli, This is continued back over the muscles, forming a part of their sheath with which it is identical, This very frequently becomes contracted with the muscles and will thus require to be cut, Each of the straight muscles of the eye is included like all others of the body in its distinct appropriate sheath, and these sheaths are extended at the sides until they meet, forming a layer between the muscles which I have denominated the intermuscular fascia, When it pas-ses back to the insertion of the muscles it is reflected off to line the lids around, becoming then what is called the conjunctival fascia, A portion of this is reflected off around

ball which it envelopes loosely, and becomes continuous with the cellular tissue surrounding the optic nerve. This is dense and strong as you see, although loose, and is called the sclerotic fascia. This should never be cut in the operation for squint as it would give rise by the vessels which run in it to a considerable and troublesome hemorrhage, yet there have been cases in which not only this but the sclerotic itself has been cut in this operation, with as you may suppose, disastrous results. The muscles which are concerned in the motions of the eye, are six in number four straight and two oblique. These are named from their relative situation superior, inferior, external and internal recti muscles, and superior and inferior oblique. They all, with the exception of the inferior oblique have their origin from the edge of the optic foramen and the cellular tissue which surrounds the optic nerve. From this point the four straight muscles go to be inserted into the upper lower, outer and inner side of the ball of the eye. These four straight muscles must evidently have by a combination of action, the power of moving the ball in any direction however oblique. And hence the functions of the oblique muscles is a matter of much dispute among anatomists and physiologists. The superior oblique arises in common with the rest and after passing through a trochlea or pully in the upper part of the orbit passes backwards to be inserted beneath the tendon of the superior rectus muscle. The inferior oblique arises from the outer anterior part of the floor of the orbit and passes obliquely backwards and inwards to be inserted upon the posterior inner side of the ball. These will serve to revolve the ball on the antero posterior axis.- and also draw the ball forward and also compress the ball of the eye in such a manner as to alter the axis of the vision. These oblique muscles about which there is such a diversity of opinion, are inserted at points exactly opposite on the ball and form a kind of band as it were around the organ. — The action of these muscles in the antagonizing of the straight muscles, is to prevent them from sinking deeply into the orbit, and keep these in their proper places. These as well as those already mentioned are the only uses which can be assigned to them. - But they are not of very great importance as I have cut them again and again without any apparent interference with the appearance or functions of the organ.

**Lect. LXVIII.** Having at our last meeting gentlemen, called your attention to the parts which environ the eye and particularly to the fascia which we found surrounding the ball as well as lining the lids. I wish at first to-day to call your attention briefly to these parts again from enlarged drawings, as they are of some importance in the operations which you will be required to perform particularly those upon the tendons of the muscles which lie beneath. You have here two views of these parts, one of which is anterior the other lateral, by which to form a proper idea of the reflections around the ball and over the lids. Now having finished the consideration of the auxilliary parts of the eye, we come to an examination of its proper structure and arrangement. The outer or Sclerotic investment engaged our attention when we last met, which was as we found perfected by the insertion into it of the cornea then being no opening in it except the cribriform arrangement, by which the optic nerve passed in, resembling in this passage, the fibres in the pith of the indian corn stalk. This point at which the optic nerve perforates the sclerotic coat as you may observe is not exactly opposite to the centre of the cornea, or at the posterior extremity of the antero posterior axis of the organ - but is found about one sixth of an inch to the inner side of this axis. Through the centre of this optic nerve passes in an artery called the opthalmic, or central artery of Zinn, this vessel passes through a distinct hole in the next or Choroid coat to get upon the third coat or retina where it ramifies supplying the whole of the interior of the organ with blood. Now if this point had been exactly in the axis of vision and been as it is insensible to impressions made by rays of light, it would necessarily rendered vision imperfect at the most sensitive point in the whole retina, which is this posterior extremity of the axis. When we remove by dissection, this sclerotic coat of the eye we have next brought into view another which from its extreme vascularity has been denominated the Choroid Coat, which extends around the whole ball with the exception of the small aperture which you see in front, which constitutes the pupil of the eye, the partition or iris being a continuation of this Choroid. When we remove the Choroid, we come to a third coat which is called the

retina, and these then make up the whole of the walls of the eye ball proper. This last, as you see is of the colour of ground glass, and is also open in front, but by a much larger orifice than any of the other Coats. To illustrate these several coverings I am obliged to make use of the large models, and drawings, as well as the eye of the bullock, as we can very rarely get an eye of the human subject in a state sufficiently fresh to exhibit the parts clearly. When we attempt to remove the sclerotic Coat, we find that at the anterior part near where the Cornea is inserted into it, it is very firmly attached to the Coats beneath by an arrangement now to be examined. This we find to be accomplished by bands of dense cellular tissue attached closely the margin of the sclerotica and also to the Choroid Coat, directing the cornea into its place by overlapping it. This is the Cilliary ligament and as it necessarily forms a ring, it has been the Annulus of albinus, - it is about two lines broad and contains in its center a small canal which is called the sinus of Fontana from its discoverer. This then serves to unite the two together in a firm manner, there being at the same time throughout the remainder of their association a very light membrane of cellular tissue spread between in order for their junction. This is called the Membrana Fuscum, and being exceedingly delicate has been compared to the arachnoid membrane of the brain, of which it has been by some considered to be a continuation, the sclerotic and Choroid being supposed by the same anatomists to be continuations of the Dura mater and pia mater. This is however is without any foundation however, there being nothing of the kind traceable, - and the analogy terminating with some little resemblance between the tissues, - this being simply a cellular layer by which the two coats are connected together. This Choroid Coat may with care be separated into two layers; it has upon its internal surface a black or very dark coloring substance spread out called the pigmentum nigrum. This is of all known colours, the most indestructable, remaining unchanged in Nitric acid, and by any moderate degree of heat, and resisting the potent effects of constant exposure to light for a century in some instances without being destroyed, although it is observed in some instances to diminish in quantity as indiv-

-uals grow to in advanced age. This pigment is arranged upon the inner face of the Choroid in a species of Cells of honeycomb or hexagonal form, and may be washed away by water, to a great extent, In a number of animals, this black pigment does not extend over all parts of the Choroid alike, but is nearly or quite deficient in one place, This from an arrangement of the membrane in a kind of tapestried form is Called the tapetum lucidum, This is found in those animals which see with facility in partial darkness,- in whom by this arrangement the collected rays are said to make a double and stronger impression upon the retina, by being reflected back in this case instead of being absorbed as in the case where the pigment is in the ordinary quantity.
There is also a spot in the eye where the optic nerve pierces the Choroid Coat, where the surface must be devoid of the pig-ment, at least to a great degree, as this nerve passes through a distinct hole in the Coat, This point is however, never to be seen in the human eye, although it may be, in some animals, A case occurred here under the care of Dr Meding which I was called to, in which there existed something of the Albino cast, in which I was enabled to see this white spot

In this case as was afterwards proved, it was a forming cataract, in the post. half of the capsule

I saw not the nerve

This Choroid Coat is composed of a vast number of vessels which ramify particularly through the outer coat, and have induced some anatomists to consider it made up entirely of vessels,-indeed the outer layer is perhaps the most vascular membrane in the human body. It is not readily separable into more than two layers, although different anatomists have made different numbers, as a venous, and an arterial beside the inner one which lodges the black pigment,- There can be however no division into venous and arterial as these vessels cannot be separated, To the outer or vascular layer as you see represented upon this large model there are two sets of arteries distributed, First you have upon each side of the ball what is called the long ciliary artery accompanied by a corresponding vein. This runs straight forward upon the Choroid, upon the outer side slightly above the horizontal plane of the axis, and upon the inner side, a corresponding distance below the same plane, before reaching the iris it branches sending one half upwards and forwards, and the other down-wards and forwards, This is important to be remembered in the operation for cataract if we wish to avoid all hem-

-orrhage. In such cases the needle should always be introd-uced somewhat below this horizontal plane when there is no danger whatever. If it be pushed through very close to the edge of the cornea however, it may be done at the middle point when the branches of the artery will pass above and below and therefore avoid being wounded, but according to my experi-ence it is best to make the puncture a little further back and somewhat below as it will then run no risk of wounding the cilliary body. The risk however, is not great in wounding one of these small branches, as the effused blood quickly becomes absorbed without producing any marked bad effects except to spoil the nicety and cleanliness of the operation. Besides these long cilliary arteries we have a great multitude of other shorter ones ramifying over the whole coat and extending them-selves into the iris and cilliary processes. These are called the short cilliary arteries. As they pass upon the iris their direction becomes perfectly linear, converging towards the pupil in immense numbers of great minuteness. These are the vessels which produce the violet coloured or pink zone upon the iris under circum-stances of inflammation, to which this body is liable with all other parts of the body, - becoming also apparent when the organ is attacked with gout or rheumatism, as it very freq-uently is. The veins which return the blood thus distributed to this very vascular coat are arranged as you may see represented upon the model, in a very peculiar manner. Uniting into a large trunk for any particular section of the coat, the join at a certain point which the approach in a curved direction, in the form of a vortex or whirl, from which they have received the name of vasa vortic-osa; - the arrangement having somewhat the form of a weeping willow. The trunks which they thus form generally pierce the sclerotic coat soon after, to terminate in the general venous system around. The inflammation which attacks these vascular tissues upon the iris may be distinguished from that of the more superficial vessels, by the sliding motion which can be produced in the outer ones whilst those of the iris are of course out of reach. Thus we have the general structure of the second or choroid coat examined, as it surrounds the greater portion of the eye ball. but have yet to examine that portion which is directed across the front of the organ. This continuation is turned inwards at an

angle with the part which surrounds the posterior part of the ball and is arranged there in a great number of folds or plaits, just as though it had been extended forward for some distance and then plaited or crimped so as to turn across and form a partial partition. Of these folds there are generally from seventy or eighty which are called the plica Choroides. Upon the end of each of these folds, projecting towards the middle of the eye, there is a pointed extremity or process, called the cil-liary process, the whole of these plica and processes together constituting the Cilliary body as it is called, this being an imperfect septum across the body of the eye. This Cilliary bod-y is extremely vascular and nervous, being supplied as before remarked by the small and long Cilliary arteries, and with nervous branches as we shall hereafter have occasion to notice. Many of these vessels run on over the Cilliary body in order to reach the iris which we must next examine. This Iris we find to be an imperfect diaphragm or partition across the anterior part of the eye about 1/10th of an inch behind the Cornea. This structure is capable of contraction and expansion as it is less or more affected by the degree of light falling upon it, and hence it becomes a kind of photometer or measurer of light, allowing just such a number of rays to fall upon the delicate retina at once, as will not make the impression injurious to it. Thus in a very intense light there is but a very small aperture through which the rays are permitted to pass, whilst in a dusky or dim light it is expanded in such a manner as to collect as many as possible. The sensations or motion of this iris in thus contracting and dilating is regulated entirely by the condition of the retina which it thus affects, for if this be amaurotic or insensible to the rays of light there is no motion in the iris, and this is one of the tests as to the integrity of the retina upon which impressions must be received in order to be appreciated. The particular arrangement and structure of this Iris is not well known, many ideas being entertained by different an-atomists upon its composition. It is seen by a very superf-icial observation with a glass, to be eminently vascular and therefore some anatomists have considered it to be of an erectile character as in some other tissues which we have examined. This is rendered somewhat probable by the arrangement of the vessels which is observed in it, there being a kind of vasc

A fallacious test - unless there are nerves in the retina not belonging to the optic, which are in reflex relation with the Iris which I think +

-ular Circle immediately around the inner edge, and a similar one upon the outer, connected together by a great number of intervening branches, but in as much as I have on many occasions divided it in the operation for artificial pupil, without ever having seen any hemorrhage occur: I am disposed to believe that there is not a sufficiency of blood circulating in it to make it thus erectile as has been supposed. I believe, from the observations which I have been enabled to make upon it, that it is muscular, and arranged in such a manner that some of the fibres run from the centre to the circumference whilst others are arranged circularly around the inner border in order that the opening may be contracted when necessary. The posterior surface of the iris is covered by hexagonal cells in which we have the black pigment lodged as in the Choroid Coat. This surface is called Uvea from its colour resembling that of the skin of a raisin, and the modifications in its colour give rise to the modifications in the colour of different eyes; this being also of course, affected by the inherent colour of the iris itself. In albinos in which this pigment is entirely wanting as well as that of the Choroid Coat inside of the organ, the light is permitted to pass through the iris as well as through the pupil, and then be reflected upon the inside of the eye so as to give rise to great disturbance in vision particularly when the light is strong. It is owing to this fact that such persons cannot expose themselves to a strong light without pain, and prefer the dusky shadows of evening when they can see much better than at noonday. We have thus finished the Choroid Coat with its continuation or appendage the iris, and take up next the Retina. This is a compound coat of exceeding delicacy of structure as you may perceive when I have it floated off from the Choroid by some fluid inserted below it. It is very thin and as you see of the appearance of ground glass, being neither perfectly opaque nor transparent. This appearance we do not know to be present in life, - but is noticed at the earliest period at which it can be examined after death. Delicate as this appears to be it is yet composed of more than one layer; the outer is of cellular matter and is called the tunica Jacobii", the inner being nervous and vascular. We find this retina to be very vascular, one of the large vessels

having been filled by a minute injection is here very visible lying upon the inner surface of the membrane. The two layers of which it is composed are separately represented upon the mane-d, and we see here where the central artery passes in to ramify upon it. The internal layer of the three is a papillary one somewhat resembling the papilla upon the fingers on a very minute scale, - into which papillae the tubular fibres and vessels run and interlace terminating in them like villi or the pile upon a piece of velvet. Upon this inner surface the impressions are made, not as upon one expanded or pany-ed extremity of the optic nerve, - but upon a peculiar structure arranged for the purpose, the optic nerve being a mere porter or carrier of the impressions thus received to the brain where they are appreciated. This retina is not generally conceived to be continued over the whole of the inner face of the choroid but to terminate where this coat turns at an angle to pass across the eye, This edge or termination is generally described as scalloped and thence termed the ora serrata. ~~Now it lines about~~ ⅔ ths of the inside of the ball which is thus enclosed by the coats which we have described, is filled with a transparent fluid which I here exhibit to you, This lies in contact with the retina all around except that it is enclosed within its own proper capsule, This capsule is called the hyaloid membrane, and its contents the hyaloid or vitreous humour, Upon the anterior portion the hyaloid membrane seems to be connected with the choroid coat by another of these mechanical connections, which lying between such delicate parts could not be cellular tissue as before, This junction is manifested by the fact that when this humour is turned out of the cavity there exists on its anterior part a zone of the pigmentum nigrum, this is called the ciliary zone, This attachment is formed by the doubling of the plaits in the ciliary body being [illegible] or dovetailed into corresponding plaits of the hyaloid tunic, which I believe is here also connected with one of the layers of the retina which is extended over, as one of the prepara-tions upon the table would go to show, This hyaloid tunic sends off from it partitions in various directions through the space within it thus dividing into a great number of cells which retain the transparent humour, in such a manner that in wounding this membrane there is no risk of any

more of it being discharged than of those cells which were wounded. This hyaloid tunic extends across behind the iris and ciliary body and splits into two layers but immediately unites again leaving a small space which extending all around forms the Canal of Petit, after this the two layers again separate and form a cell as it were, into which is received the crystaline lens enclosed in its capsule. It has been said that between the capsule of the lens and this hyaloid tunic there was a fluid called the liquor of morgagni, but this I believe has never been found. At the posterior part of the eye there exists a yellow spot observed by Soemmering and called the limbus luteum, in the centre of which is a black point called the hole of Soemmering but this is not a hole but a spot. These are never found except in man and monkeys when I have had occasion to observe it. The capsule of the crystaline lens is vascular with the rest of these structures, receiving its blood from the central artery of Zinn. These cannot however be injected except in the foetus but of their existence there is no doubt. This crystaline lens which forms the third humour of the eye, is of a lenticular or doubly convex shape, being more convex on the posterior than the anterior surface. It is about 4th of an inch in diameter and 5th of an inch thick, being situated in this partition. This when macerated we find will divide into three portions, all being made up of layers superimposed one upon another. In the operation for cataract we frequently find the lens in this macerated condition which makes the de-histons cataract as it is called. The outer layers of this lens are almost gelatinous whilst they become successively harder as you approach the centre. When hardened by spts of wine the fibrous structure is rendered very apparent in separating it. The opacity of this body or its capsule constitutes cataract which is varied as the one or the other is affected. By this lens and the partition in which it is lodged, the whole cavity of the eye are divided into two cavities or chambers as they are called, anterior and posterior. The former is included between the lens and the posterior surface of the cornea and is separated into two compartments by the iris, the anterior of which is the largest, the posterior being very small. This anterior chamber is filled by a fluid also enclosed in its proper capsule lining the cornea iris and probably the anterior face of the hyaloid tunic. This is called the aqueous humour of the eye from its resemblance to water.

Lect. LXIX.

I wish to day gentlemen to call your attention to the nerves of the face, particularly to those which supply those parts in the study of which we have recently engaged ourselves. - the others having been considered in association with the parts to which they were distributed. The nerve of proper sense to the eye is the Optic or Second pair of the old arrangement previous to the consideration of which, to make the sketch more complete, we will devote a few minutes to a recapitulation of the first pair or Olfactory nerves. The origin of these from the base of the brain we have heretofore noticed at length, when we found it continued along the lower surface of the Cerebrum until it had reached the anterior part of the Cranium when it formed a bulbous terminating or enlargement on the cribriform plate of the ethmoid bone, by the side of the Crista galli; This Olfactory bulb although not large in man, is of very considerable size in some of the inferior animals, containing a cavity or sinus which is lined by a serous membrane and generally contains some fluid within it. This is doubtless of great importance, as it is found most perfectly developed in those animals most noted for a keen sense of smell. Through the small foramina in the cribriform plate, a great number of fillaments pass down into the upper part of the nostrils. These are extremely minute and delicate, and are yet covered by a process from the dura mater enclosing each, as its neurilema. After perforating this cribriform plate the branches are divided into two sets, an internal and external, - the former of which are distributed to the mucous membrane which covers the upper part of the vomer upon one side. as is represented upon the large model, as well as shown upon the different preparations upon the table. The second or external range of fillaments are distributed in a like manner to the external walls of the nostril, none of them decending into the lower part of the nose. The second pair or Optic nerves are represented upon the large drawing as well as upon the various preparations before us. Each of these Nerves arises by two roots. - One from the posterior portion of the thalamus of the Optic nerve or posterior ganglion of the cerebrum as it is called, - and the other from one of the four bodies called the tubercula quadrigemina, namely the nates. These two roots join to form a large nerve which passes back and circumscribes the crus of the cerebrum

and proceeds forwards to the body of the Sphenoid bone. From the fact that the optic nerves in animals arise solely from the tubercula quadrigemina in animals, these have been called by some the optic lobes, but in man they also originate from a prominence upon the thalamus called the corpora geniculata externa. After passing upon each side of the body of the Sphenoid bone, they are united upon the anterior portion of this body upon a slight eminence called the olivary process, from which union they again diverge to gain the orbit through the optic foramen, entering the ball at a point inside of the visual axis, as before mentioned. The arrangement at this union, whether it be a crossing, a partial crossing, or a mere connexion, has been until very recently a matter of dispute and great diversity of opinion, although it is generally spoken of as the chiasm or crossing of the optic nerves. It has lately however been decided by positive demonstration that the inner fibres of each nerve do cross over to the opposite sides, whilst the outer ones simply make a curve and pass on to the eye of the respective side, as is represented upon this enlarged diagram. In addition to this there are, under the microscope, observed a number of small anastomotic fibres running in different directions in this chiasm. Thus the trunks which pass to either eye are formed of portions of both the original nerves, and hence a tumour pressing upon one of the nerves before the point of crossing would of course influence the corresponding eye, whilst if such pressure be made behind the chiasm, both eyes would be necessarily impaired, without total destruction of either. The optic nerve as it passes on to the orbit is accompanied by other nerves which we must now notice, the first of which is the third pair or Motor Communis oculi. This nerve is very well shown upon this elaborately dissected preparation, running exclusively to some of the muscles of the eye. Another accompanying nerve is the fourth sometimes called the pathetic. This is traced to the superior oblique muscle of the eye alone, being very small resembling a strain of fine thread, but still enclosed in a sheath or process from the dura mater. Another nerve which is more deeply placed than either of those which we have yet noticed is the Sixth or Abducens

oculi. This passes forwards between the Carotid artery as it ascends to the brain, and the cavernous sinus which is seated alongside of the sella turcica, and with the exception of some fibres sent down upon the artery, is distributed entirely to the external rectus or abducens muscle and hence its name of abducens. The branches which this nerve sends down along the Carotid goes to be connected with the great sympathetic. The third pair which is represented by the distribution of the cords upon the model, are called Motores Communes because they are common to a majority of the muscles, giving motion to them. This nerve divides about the point of entrance into the orbit into two branches a superior and inferior. The superior is distributed mainly to the superior rectus muscle but also sends a branch to the levator palpebra superioris. The inferior portion of the nerve separates into three branches, one to each, internal and inferior rectus, and one to the inferior oblique muscle, and the remaining division is a small filament which goes to the small lenticular or opthalmic ganglion. This is a very delicate little ganglion belonging properly to the great sympathetic as we shall hereafter see. The fourth we have noticed supplies solely the superior oblique muscle, and the sixth with the exception of a small filament or two, completes the supply to the muscles of the eye with the external rectus. Now all these with the exception of the optic nerve supply motion to the parts to which they are sent, but we have now to consider one of a different character. The Trigeminus or fifth pair of nerves are principally nerves of sensation, arising however by two roots, the one from each tract of the spinal marrow as we have before observed. The fibres from the motor tract are few in number and are distributed as we shall hereafter notice. At the side of the Sella Turcica there is as you perceive a very considerable enlargement upon this great trunk, which constitutes the semilunar ganglion or ganglion of Gasser. This ganglion is here bound down by processes of the dura mater, and from it we have here given off the three great branches into which this nerve divides. The first is the superior or opthalmic branch which passes into the orbit through the foramen lacerum of the orbit. The second is the middle or superior maxillary branch, which passes through the

foramen rotundum of the sphenoid bone. and the third or inferior branch, is the inferior maxillary and passes through the foramen ovale. The first of these which must receive our attention is the first branch or Opthalmic nerve. This after getting into the orbit as before noticed, is separated into three branches. the first of which supplies the lachrymal gland. The second branch is the frontal or supra orbitar, which proceeds up to the under edge of the superciliary ridge near the trochlea of the superior oblique muscle where it separates into two branches. The one smaller passes over the trochlearis muscle and is distributed to the parts in the immediate neighbourhood, whilst the main supra orbitar nerve passes over the ridge sometimes in a notch, at others in a complete foramen, - by which it gains the forehead over which it is distributed to the integuments running back as far as the crown of the head and anastomosing with branches from the superior cervical nerves Even in this preparation with which particular care has not been taken in the dissection, it may be traced as far up as the crown of the head. The third branch of this Opthalmic nerve is the Nasal. This branch proceeds along the nasal side of the orbit, and sends off first a branch to the lenticular ganglion, after which it divides into two branches called external and internal nasal. The external is distributed to the lachrymal apparatus and integuments about the internal canthus of the eye whilst the internal passes back into the cranium through the internal orbitar foramen, where it passes along the cribriform plate of the ethmoid bone for a short distance and gets through into the upper part of the nostril. Here it terminates in filaments which are spread out upon the various structures around Thus we have the general distribution of the opthalmic branch of the fifth pair with the exception of some small branches which go to the eye called the long cilliary nerves. These are sent off from the nasal branch and are distributed directly to the iris and choroid coat, whilst another portion of this nasal branch also reaches the ball through the lenticular ganglion which we shall hereafter see gives off the short cilliary nerves to these parts. This lenticular or opthalmic ganglion is formed as we can now understand by a branch from the third pair or motor oculi and another from this nasal branch of the opthalmic, and from

it are sent off a shower of branches to the eye which perforate the Sclerotic coat as the short Cilliary nerves and are distributed to the Choroid Coat, Iris, and other parts around. These with the two long Cilliary nerves which come off directly from the nasal branch of the opthalmic supply the whole of this structure with both sensation and motion, Thus we may trace the motions of the iris to the third pair through the opthalmic ganglion, and we know that when this third pair is destroyed all motion in the iris is lost, These complicated distributions are well exhibited upon this enlarged drawing where I again for a moment call your attention to them in order that you may fairly understand them, The next which comes up for our consideration is the second branch of the fifth pair or Superior Maxillary nerve. The general distribution of this is to the upper jaw, teeth, and face. From the foramen rotundum through which we have seen this branch pass, it is continued as a main trunk between the plates of the floor of the orbit, in the infra orbitar canal, until it emerges upon the upper part of the Cheek through the infra orbitar foramen. This infra orbitar nerve as it is now called divides into a great multitude of branches some of which are distributed to the side of the nose, others to the whole of the surrounding portions of the Cheek, whilst others yet pass down, pierce the superior maxillary bone and supply the incisor and bicuspid teeth. Whilst yet in the infra orbitar canal this superior maxillary nerve sends off first the posterior dental or alveolar nerves two in number, these are subdivided in such a manner as to give a branch to each molar tooth, and thus supply all which have not been mentioned as supplied by the infra orbitar, Two other small branches are sent down from this nerve to form the ganglion of Meckel or Spheno palatine ganglion From this ganglion we have several branches constituting the lateral nasal nerves which get through the spheno palatine foramen and are distributed upon the lining membrane of the nose. One of the largest of these however passes along the septum to the anterior part where it passes into the foramen incisivum which we have heretofore noticed and is then distributed to the lining membrane of the roof of the mouth Upon this branch as it passes through the foramen is developed a small ganglion called the naso palatine or ganglion of

Cloquet. There is also given off from this spheno palatine ganglion a branch called the posterior palatine branch (often two) which passing through the posterior palatine canal, sends off small filaments to the inferior turbinated bone, and afterwards spreads out upon the soft pallate in to a number of branches some of which go forward on the roof of the mouth whilst others supply the uvula and surrounding parts. We next have from this ganglion the Pterygoid nerve which after passing through the pterygoid process of the sphenoid bone divides into what is sometimes called the superficial and deep seated petrous nerves, the smaller of which however is the true vidian nerve, hereafter to be reverted to. The other or petrous branch runs back through the carotid foramen to join with the filament sent down from the sixth pair to form a small ganglion near the ear called the ganglion ~~[illegible]~~ caroticum or of Laumonier. Upon this enlarged drawing these representations are much much more clear than upon the subject as they are not complicated to such an extent by other parts. The remaining or vidian branch of this pterygoid nerve as you see leaves it to proceed backwards to the petrous portion of the temporal bone into which it passes through the hiatus fallopii and after joining the portio dura of the seventh pair again separates and proceeds out below as the chorda tympani nerve to join the lingual branch of the fifth pair just before its entrance into the submaxillary ganglion. The next or third branch of the fifth pair is called the inferior maxillary nerve, and passes out of the cranium through the foramen ovale. This branch then divides into two large trunks, the one external, the other internal. The first of these or external, which contains all the motor fibres of the fifth pair, is entirely a motor nerve, being distributed to the muscles concerned in mastication. Thus it sends branches to the temporal and masseter muscles, and also to the pterygoids as well as a filament to the buccinator, and some small ones to the ear and side of the head. The remaining branch is divided into two trunks, the one of which is distributed to the lower jaw, and the other called the lingual branch is distributed to the tongue. This lingual branch after passing off between the pterygoid muscles, receives the chorda tympani or vidian nerve, and proceeding down the side of

cheek between the lining membrane and the muscles distrib-
-utes some small branches to the muscles in its route as the
mylo hyoid, and then passes on to the lower surface of
the tongue near the point; here it divides into a great
number of branches which are distributed to all parts
of the tongue, many reaching the surface of the organ
whence has arisen the supposition of some that it is pri-
-marily concerned in the function of taste. This branch
as before remarked sends off a filament to the submaxilla-
-ry ganglion after having been joined by the vidian, many
persons supposing this branch to be the vidian which was
thus only enclosed so far in the sheath of the lingual branch.
This submaxillary ganglion is supposed to govern the
secretion from the submaxillary and sublingual glands
near which it is situated, and to which it sends off a
number of branches. The remaining branch or inferior
dental nerve passes into the canal in the inferior maxil-
-lary bone just within the ramus, previous to which it
sends some small branches to the surrounding parts.
After entering the inferior dental canal it sends off a
branch to each tooth, accompanying the artery forward
until it reaches the mental foramen, where it again
issues to get upon the chin, after having sent forward a
branch within to supply the incisor teeth and anastom-
-ose with its fellow of the other side. After issuing upon the
chin it supplies the integuments around and the lower
lip. Thus we have examined the three branches of the
great trigeminus or fifth pair the nerve of general sen-
-sibility to the whole of the face. This is the nerve, or rather
its branches are they which most commonly, or perhaps
always are the seats of those painful neuralgias or tic
doloreux which so often affect the face, and the most
common seats of them are the three points at which the
three branches of this nerve emerge upon the front of the
face, namely the point where the ophthalmic branch
or supra orbital comes out upon the forehead, - the infra
orbitar below the orbit, and the inferior dental upon
the chin. These three points may be covered by a line
drawn vertically from the chin over the forehead, so nearly
do they coincide with each other in their place of emergence.
Besides these, we have other nerves of the face which altho-
-ugh already studied, may be briefly recapitulated with

advantage in order to present the full distribution at one view. The other nerve distributed to these parts is the Facial or portio dura of the seventh pair. This emerges upon the face just in front of the ear where its inradiation has given it the name of pes anserina or gooses foot. This has three great divisions in its mode of supplying. One to the temporal portion, another to the middle of the face and the third to the lower part of the face and upper part of the neck. This is decidedly a nerve of motion and expression, and not of sensibility. It therefore cannot possibly be concerned in any of those painful affections about the face which have been already mentioned, although the mixing of the branches of this with those of the fifth pair in the different localities, would seem to point to this as well as to the last mentioned nerve. Having seen its origin however, and being familiar with its functions, we must at once see that it cannot be implicated in any affection of a painful nature. The connexions of the branches from the fifth and sixth pairs of nerves with the great sympathetic in the ganglions in the orbit and near the ear have heretofore been considered as the uppermost points or commencement of this great system, together with those which serve to form with the branches from the fifth pair the spheno palatine or ganglion of Meckel, but this we now know is not the case, as the parts here within the cranium require the presence of the sympathetic for their nutrition as well as any other portions of the body. It is therefore now demonstrated that we have six of these ganglia about the head. The uppermost one is the ganglion of Ribes which lies upon the communicating arteries of the brain, the next is the opthalmic, and the next the ganglion of Meckel and then the naso palatine in the foramen incisivum or ganglion of Cloquet. Then the submaxillary which lies beneath the lower jaw near the submaxillary gland and lastly the ganglion of Arnold which is not seen in this representation but which is found near the foramen ovale of the sphenoid bone, and spoken of as the auditory ganglion. There is also another small ganglion or plexus called the carotid ganglion which exists upon the upper portion of the carotid artery after it has emerged from the petrous

portion of the temporal bone.

Lect. LXX.

I propose to day gentlemen, that we direct our attention to the study of the Great Sympathetic, a rapid and comprehensive glance at which is all that is now required after noticing its ramifications and connexions, in association with the parts to which it is supplied. Physiologists who have written upon the nervous system previous to a very late date, among which was the celebrated Bichat,- divide it into two great centres or systems, the one consisting of the Brain and Spinal axis as the Centre of animal life, from which branches are irradiated to every part of the animal economy,- the other consisting of the Great Sympathetic, which was supposed to be distinct in existence as well as function, was conceived to govern the actions of organic life, or that by which the independent organism was maintained. Since the time of Marshall Hall however, these ideas have been in a great measure revolutionized. This Physiologist has shown that the Spinal Marrow is to be regarded as a distinct portion of the nervous system, and to consist in a Chain of Ganglia, attached in the form of a column, and to preside over the functions of the organic being,- thus cutting down the Sympathetic from the position which it formerly occupied,- or associating with it in this function another portion of the nervous system,- the reflex, of Marshall Hall, which has been dwelt upon at length in another place. To constitute a complete nervous apparatus, we require some Cineritious or cortical substance such as we find upon the surface of the brain,- and some medullary matter to transmit impressions to, and from this grey matter,- the first being necessary to originate the nervous influence and the white, to carry this influence. Thus a nervous apparatus is comparable to a galvanic Battery with its two conducting wires to give expression to its power. This comparison holds good not only as regards the Sympathetic, but also with the Centres of animal life. It has been supposed by some that this Sympathetic system is particularly related with the Circulation of the blood, from the fact that the branches from it are found in great numbers around the arteries. This is however a mere accident or convenience by which the arteries are made to subserve the purpose of conducting these nerves to the parts to which they are destined as they are found to supply every organ and tissue from which secretion is accomplished, throughout the economy.

We have first to turn our attention to what was formerly consid-idered as the great sympathetic Centre, or Centre of Organic existence. This is constituted of an immense number of branches and ganglia which form an interlacement around the Celiac artery where it is given off from the aorta. This form having a somewhat lunated form has been called the great Semi-lunar Ganglion, or by Old Wrisberg, the Abdominal Brain which it somewhat resembles in the consequences which result from concussions of it, as by kicks, blows &c over the region which are often fatal from the implication of these nerves. This semilunar Ganglion is composed of a great number of smaller ganglia united together by short anastomosing branches which by their great numbers constitute the Sympathetic Centre. This is placed in direct communication with the brain, in order that the viscera which it supplies should hold a proper relation with this great Centre. for although the association is not manifested in a condition of health, yet in disease there was a necessity that the brain should be made cognisant to the sufferings of the organs and every day experience teaches us how close the alliance is. This direct communication is made by means of the par vagum or pneumogastric nerve which as we have seen, after supplying the larynx, lungs, heart and stomach, sends a large branch on down to join this semilunar ganglion. Starting from this as a centre, we notice first, upon either side of the Spinal Column and nearly over the head of each rib, a row or series of ganglia, communicating with each other by two or more branches, and communicating behind by two roots generally, with the intercostal nerves which come from the Spinal marrow. and by them with the cineritious substance of the cord. These ganglia are first the superior, middle, and inferior cervical, - from the first of which we have a connexion with those six others mentioned, at the last lecture, as existing about the head, and being parts of the great Sympathetic there being probably more of these little ganglia yet undiscovered. Then secondly we have twelve dorsal ganglia near the heads of the ribs as before mentioned, - below these there are generally five, sometimes four lumbar ganglia which communicate with the dorsal, and with the spinal lumbar nerves by posterior branches, as well as with these below, which consist of three or four

sacral and one coccygeal ganglion which terminates and perfects the line, all communicating through each other and with the semilunar ganglion and its branches by two considerable trunks called the greater and lesser Splanchnic. The general characteristic of the nerves of the sympathetic system is here well developed in the softness which they exhibit when compared with those of animal life. The upper cervical ganglion of the sympathetic anastomoses by branches with the fifth, and with the spinal accessory and glosso pharyngeal of the eighth pairs of cranial nerves and by the intercostals, lumbar, sacral and coccygeal ganglia with all the nerves of animal life in their several regions. From each of the three cervical ganglia there are branches sent off which after forming a net work around the aorta reach the heart as the cardiac branches of the great sympathetic. These run to the substance of the heart forming the cardiac plexus where we also find distinct cardiac ganglia and over each coronary artery a separate interlacing called the right and left ~~cardiac~~ coronary plexuses. These ganglia and plexuses which belong to the tissue of the heart perhaps account in a satisfactory manner for the fact that in many of the inferior orders of animals particularly the sturgeon among fish, this organ will go on contracting for a considerable length of time, even for hours, after having been entirely separated from all contact or connexion with the remainder of the body. The pain which is felt in the various affections of the heart is of course entirely independent of any agency of these nerves, being conducted and appreciated through the branches which the organ receives from the recurrent laryngeal and pneumogastric trunk which have been noticed on a former occasion. From the upper dorsal ganglia, a number of branches pass off to the lungs, entering into the constitution of the anterior and posterior pulmonary plexuses before noticed at the roots of the lungs. From the sixth down to the tenth ganglia, a branch is sent off which uniting successively to each other by the sides of the vertebra, there is formed a large trunk which is called the great splanchnic nerve in consequence of being distributed to the viscera of the abdomen. Another, the lesser splanchnic is formed by the junction of branches from the tenth, eleventh and twelfth

dorsal ganglion. This smaller one divides, sending a branch to the renal plexus, whilst the other joins the greater Splanchnic. From the Phrenic nerve, or nerve of the diaphragm which we have heretofore seen originating in the neck there is also a branch sent on to join the semilunar ganglion, making the character of this great muscle perfectly intelligible, as we know that it is partly under the control of the will, and partly otherwise. From this semilunar ganglion there are also innumerable branches distributed to the various viscera in the abdomen. The Spleen first receives a very large proportional share of them, thus seeming to indicate its importance, notwithstanding what was said when considering the organ. Another body to which we can assign neither use nor importance receives a great number of branches from this system, namely, the supra renal or attra Bilary capsules as they have been called in olden times. The Kidneys also receive an immense number of these nerves forming a complete network or coating to the renal arteries which is known as the renal plexuses. The wherefore of this profuse supply we can readily understand when we see that about one sixth of the whole mass of blood has to pass through these organs, from which is effected the most extensive secretion of any in the economy. The Stomach also, as a very important organ, receives a large share of these nerves forming around the gastric Coronary ~~organs~~ arteries, the gastric coronary plexus. The plexus which surrounds the hepatic artery, from which the liver is supplied, is also a very extensive one as is well shown upon some of these preparations. Into this hepatic plexus there enters a branch from the pneumogastric which is thus distributed to the substance of the liver. Around the superior and inferior Mesenteric arteries we also find an immense number of branches interwoven, constituting the respective plexuses. These run with the arteries and are distributed very minutely over the whole of the intestinal canal as may be observed in the direction where they appear so numerous that the point of a pin could not be inserted without wounding some of them. Then we have the Spermatic plexus formed around the testicle so as to give it as it were, a nervous envelope. This is however in no wise concerned in the exceeding

sensitiveness of this organ, which sensitiveness is entirely derived from the spinal nerves which we have traced to it on another occasion. In addition to these we have the Sciatic plexuses and where the aorta bifurcates, the aortic plexus which divides upon the iliacs into the iliac plexuses, which again branch, and with the sacral ganglia form the hypogastric plexus. This latter is made up not simply or principally of these sympathetic nerves, as was the case with the others which we have noticed, but consist in a considerable admixture of spinal nerves from the lumbar and sacral plexuses. This of course must necessarily be the case in order to give to the pelvic viscera that partly voluntary and partly involuntary character which we know them to possess. In this they resemble pharynx or parts concerned in deglutition, where we know the source of the nervous influence from the phenomena which are witnessed in the exercise of the functions of the part. Thus before a bolus has passed the fauces it can be recall -ed into the mouth again at will, but after being once fairly within the grasp of the constrictor muscles, it is entirely beyond the action of volition. This makes up a general sketch of the distribution of the great sympathetic, which may be hastily reviewed with more clearness perhaps from these enlarged representations. When one of these sympathetic nerves is examined by means of a high microscopic power it is found to consist of minute filliaments which are covered at short distances by little spherules as is represented in the diagram wher -ever the filliaments from the this and the nervous system of animal life may be contrasted under a highly magnified condition. These filliaments when they enter a ganglion are separated from each other, and the cineritious matter of which the gland is principally composed, is deposited in the interstices between these filliaments. This arrangement is well represented by many of the drawings upon the table. We must in the next place turn our attention for the remainder of our time to a view of the Absorbent System. Of the particular arrangement of these we have a beautiful mercurial injected specimen upon the table where a great number of vessels and glands of the groin and lower extremity have been injected from a single tube

inserted into one of the vessels of the foot. These are as you see unlike the arteries and veins, in that they do not anastomose, but generally pursue an independent course to the gland. These vessels are very prone to inf-lammation from various causes, which on account of their want of communication, may effect a single one or a number together. The material carried by these vessels when taken from the general system, is the debris of the different parts from which comes, consisting of the molecules which are no longer fit to serve the purposes of formation in the various tissues without undergoing a process of renovation. This fluid is termed Lymph, and hence these are often termed the Lymph-atic vessels, or the Lymphatic System. This lymph appears upon analysis, as well as in its habitudes, to differ from the liquor sanguinis of the blood only in being devoid of the red globules or colouring matter. With regard to the ultimate ter-mination of the arteries and veins we are at present satisfied, believing them to be capillary continuations of each other, but with regard to the ultimate origin of the absorbents very little that is satisfactory is as yet known. This does not arise from their extreme minuteness, as much as from the impossibility of injecting them towards their extremities. Such injection downwards of these is prevented by the great number and perfection of the valves, which are found throughout this system there being constituted of the folds of the lining membrane in the same manner with the veins. So far as has been observed with regard to them, it is probable that their origin is from the cellular tissue, this being supposed to consist of very minute cylindrical tubes $\frac{1}{2000}$ of an inch in diameter, the union of which may, according to late microscopic observers, form the absorbent vessels. The most minute as well as the larger vessels which have been accurately observed, are found to be lined by an extremely delicate serous membrane anal-agous to that of the blood vessels. Upon the outside of this there exists a fibrous contractile coat, by the agency of wh-ich it is probable that the fluid is driven forward towards the glands. Exterior to this again we have a coating of cell-ular tissue surrounding them, which renders their analogy to the arterial vessels perfect, having the coats of the same number and character. In their positions throughout the body they are analagous to the veins, the greater number being superficial and therefore liable to be wounded by the slightest disturbance

in the continuity of the surface. Those which are deeply seated generally follow the course of the veins, the trunks never being of any considerable size however, when compared with these vessels. They differ from the veins in respect to being studded in every part of their course by glands, which seem to answer the purpose of the Government stations upon the great thoroughfares of a nation, where everything must be subjected to inspection and examination before it is permitted to enter into the great organism, lest possibly something which is contraband or hurtful might enter and exert its injurious or corrupt influence over the economy. Thus we see that these vessels absorb everything which comes in their way, and as in the case of the poisonous matter of Syphilis, are not affected by it, - but when such matters reach these glands, it becomes arrested in part and causing irritation and inflammation in them, is thrown off by a process of suppuration. The vessels which carry the lymph to these gland are called afferent whilst those which carry it from them are the efferent, - the first set being greatly the most numerous, as they seem to be condensed in the body of the gland and emerge from it in larger trunks. The afferent vessels after entering these glands, divide and sub-divide to the most minute degree, and do not as was formerly supposed, terminate in cells in the body of the gland. These ramifications again unite to form the larger trunks which leave them at a point opposite to that of entrance. In the injections usually made, these vessels do not seem to be numerous, and the injuries which they must receive in the most common accidents, without giving rise to serious consequences, would seem to indicate that such were not of great importance but in the jar upon the table I present to you the arm which I was obliged to amputate from a lady in this City, in which the disease of these vessels from the prick of a needle, was the sole cause of the mischief. These affections I have generally found to be very manageable when taken in time, but in this case when I was not called in until a late period, nothing could be done to save the patients life, except the amputation of the limb. This then shows you what a very slight affection may by neglect or mistreatment, come to occasion much trouble,

Upon this very large drawing which I made some fifteen years since, you have magnified representation of all the principal lymphatics, - the superficial upon one side and the deep seated upon the other. Those from the lower extremities after passing through the glands in the groin, pass with those of the pelvis to form a kind of pouch or sack at the bifurcation of the aorta, called the receptaculum chyli whence you have the commencement of the great thoracic duct which after receiving the various branches from the intestine ascends to empty into the left subclavian at its junction with the internal jugular vein. Those from the upper extremities and head form trunks called the Brachio Cephalic, the right one of which empties into the right subclavian vein. The absorbents from the penis and scrotum generally run through the lymphatic glands of the groin. This will serve to explain the inflammation of these in syphilitic affections of those parts. There are however some of these lymphatics which do not pass through the glands of the groin and thus we can account for the implication of the system at times without the intervention of bubo. After leaving the glands of the groin the vessels pass up the iliac arteries where there is a great collection of glands which are so interwoven with each other as to give to the mass a resemblance to the pancreas, where they cover the lumbar vertebrae. These vessels are distributed every where throughout the economy and take up all that they can get, hence we find them varying somewhat in the different situations in which they are found. Thus the lymphatics of the small intestine are called lacteals as they convey the chyle which is absorbed by the villi, and the glands which they pass through before entering the receptacle, are called the mesenteric glands, from their seat upon the mesentery. Their distribution through all the glandular structures are very profuse, and they generally partake of the colour of the organ, as found in the liver they are yellow, - in the spleen red and so forth. They are also very numerous in the heart and lungs, but in the latter there is not a gland to be found. The form of distribution and arrangement is well seen upon these drawings, as well as a very much

magnified view of the Glands showing the manner of arrangement in them, The receptacle is here also well shown with the manner in which the great duct is formed from it. With this view of the absorbent System gentlemen, we now close our anatomical Course having reviewed and studied all the points which concern us as Physicians, pertaining to the animal economy,

Finis